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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 36.] 1939. [No. 4.

SUMMARY OF RECENT ABSTRACTS.

III. MALARIA.*

[continued from p. 192.]

Treatment.

Quinine, atebrin and plasmoquine.

RUSSELL (p. 418) discusses the requirements and production of quinine in India. COHEN, KING and AINLEY (p. 515) tested and report on the chemistry and activity of certain derivatives and analogues of cinchona alkaloids.

GUNTHER (p. 102) in New Guinea regards quinine as much superior to any other drug in the treatment and prophylaxis of malaria. EJERCITO and SANTOS (p. 31) found that quinine sulphate and Philippine totaquina gave similar results. MIYAHARA *et al.* (p. 419) found that the therapeutic value of euquinine in mass treatment was low. It has no effect upon the gametocytes of *P. falciparum* and is most widely used by children who are the source of infection. It is also expensive. This author considers that takequina, a totaquina, is eminently suitable for mass treatment and is cheap. The dose is 0·8 gm. daily for 14 days. Fifteen cases were treated with euquinine and 20 with takequina.

GUPTA (p. 517) reports the treatment of a pregnant woman with *falciparum* malaria by the intramuscular injection of 10 grains of quinine three times daily for three days. Recovery was rapid and two months later she gave birth to a healthy child. Reference is made in the *Journal of the American Medical Association* (p. 517) to experiments in which quinine was found in human milk soon after administration but not after 24 hours.

THOMAS and SYDENSTRICKER (p. 812) treat cerebral malaria by giving 2 to 4 litres of Ringer's solution subcutaneously during the first 24 hours, to combat dehydration. Dextrose solution, 10 per cent. is given intravenously, 500 cc. every four to six hours. Quinine dihydrochloride, 0·5 gm., is added to the first dextrose injection and repeated every six hours until cerebral symptoms have disappeared

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1938, Vol. 35. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

or the patient can take drugs by the mouth. BORMIOLI (p. 29) treats pernicious *falciparum* infections by a first intravenous injection of 2 gm. quinine followed during the first 24 hours by three intramuscular injections each of 1 gm. quinine. On the second and third days 4 gm. daily are given by injection and further treatment on the same heroic scale is given if necessary. He states that this kills all forms of the parasite and prevents relapse.

MÜHLENS (p. 103) reports cases of quinine idiosyncrasy with circulatory disturbances, urticaria, oedematous swellings of or haemorrhages into or from skin and mucous membranes. These haemorrhages may be serious, even fatal. The synthetic drugs have not produced haemorrhages.

PIETRO (p. 510) gives a heavy course of treatment for malaria in Italian East Africa which includes quinine intravenously and by the mouth, the synthetic drugs, and neosalvarsan.

Comparisons between quinine and atebrin have been made by several authors. KRANZFELD *et al.* (p. 420) treated 389 cases with acriquine, the Russian equivalent of atebrin (0·15 gm. b.i.d. for five days) and 94 with quinine (1·5 gm. daily). The proportions of parasitic relapses were almost equal, *vivax* relapses being four times as frequent as *falciparum* with both treatments. TILLEMA (p. 421) treated 140 patients with quinine (0·4 gm. thrice daily for a week) and 120 with atebrin (0·1 gm. thrice daily for a week). Differences in results were negligible and relapses frequent. Quinine should be continued for a week and atebrin for five days after disappearance of parasites. OVERBEEK and GILBERT (p. 516) treated 100 cases of benign tertian malaria, 53 with 0·3 gm. atebrin daily for five days, 47 with 1·3 gm. quinine daily for seven days. The rates of action were equal, but three weeks after treatment 34 per cent. of the quinine group harboured parasites compared with 5·6 per cent. of the atebrin group. MIYAHARA (p. 516) after treating 30 cases with 0·3 gm. atebrin daily for five days concludes that it is no more effective than quinine in preventing relapses. *Vivax*, *falciparum* and *malariae* infections were included.

These results should be compared with those of CALAN and others below.

Action.—The action of drugs on the various stages of parasites has been studied by a number of authors. CIUCA *et al.* (p. 32) consider that the therapeutic action of quinine and atebrin are upon the schizogonic forms of the parasite and not upon the sporozoites or any intermediate stages. SINTON (p. 894) states that atebrin is known to produce morphological changes in both sexual and asexual forms of *P. vivax* and *P. malariae* and in the asexual forms of *P. falciparum*. Observations at Horton, however, have shown that atebrin is not without effect on the crescents of the Rumanian strain of *P. falciparum* in use there if administered before crescents are detected in the peripheral blood. When crescents appeared after this treatment, certain changes were noted and are described. DE SANT'ANA QUEIROZ (p. 565) in experiments on monkeys infected with *P. knowlesi* found that atebrin was progressively more active as the development of the parasites progressed; most so when given at the stage of chromatin division; much less so when sporulation was taking place.

GENTZKOW (p. 569) describes a method of estimating atebrin in the blood, and CHOPRA and ROY (p. 570) one for estimating atebrin in tissues. WEISE (p. 103) discusses the estimation of atebrin in urine,

stools and blood. FARINAUD *et al.* (p. 518) found that after a five-day course of quinacrine (the French equivalent of atebrin) the drug only appears in the urine after a lapse of time (4 days in the first case). It is then excreted for four or five days in considerable amounts, becoming less and less for a month. A period of 70 days is usually required for total elimination, but the total amount found in the urine is only a small proportion of the amount administered.

The Malaria Advisory Board of the Federated Malay States (p. 20) report that atebrin musonate is one of the most powerful schizonticides known, but as toxic effects are occasionally alarming it is not a drug which can be recommended for indiscriminate use. [See also this *Bulletin*, 1936, Vol. 33, p. 235, 834.]

HILL (p. 657) considers that atebrin is the first drug known that could possibly be used effectively in mass treatment and prophylaxis. A curative dose can be given without interference with working efficiency.

MATILLA, FÁBREGA and VICH (p. 419) prescribe, for persons over 10 years, atebrin 0·3 gm. daily for seven days, a pause of three days, than plasmoquine 0·03 gm. daily for 5 days. They claim, from 100 cases, rapid cure and protection from relapses in benign and malignant tertian malaria. This treatment is not contraindicated in pregnancy, and atebrin is the drug of choice in blackwater fever, followed by plasmoquine if gametocytes are present. DOMÍNGUEZ CALÁN (p. 895) compares relapse rates of from 1·2 per cent. to *nil* in three groups of patients with *vivax* infection treated by three combinations of atebrin and plasmoquine (total 150 cases) with a relapse rate of 59·58 per cent. in 2,712 cases treated with quinine for 20 days. MELMAN (p. 513) cured a child of four with atebrin and plasmoquine when quinine had failed, and advocates atebrin for malaria in childhood. CHOPRA, HAYTER and SEN (p. 30) compared 45 cases of malaria (14 *vivax*, 20 *falciparum*, 3 *malariae* and 8 mixed infections) treated with atebrin-plasmoquine dragées (atebrin 0·1 gm., plasmoquine 0·005 gm., one dragée thrice daily for five days) with 37 treated with atebrin alone. The combination is no more effective than atebrin alone in *vivax* and *malariae* cases but is more effective in *falciparum* infections, especially if crescents are present. REY (p. 897) in Spain used Atepe tablets, containing atebrin 0·1 gm. and plasmoquine 0·005 gm. in the treatment of 686 cases of benign tertian malaria. The dose for adults was 3 tablets daily for five, or in severe cases seven, consecutive days. The tablets were given in one daily dose. The relapse rate was 12 per cent.

NANDI and DIKSHIT (p. 664) describe a colour test for plasmoquine in blood and tissues. It is not suitable for urine.

Other drugs.

MISSIROLI and MOSNA (p. 564) give 2 cgm. Cilional (discovered by SCHULEMANN) daily for six days. They consider that, used with quinine or atebrin, cilional provides a complete anti-malarial remedy. Its action on the gametes of *P. falciparum* is equal to that of plasmoquine and it is not toxic in efficient therapeutic doses. KIKUTH (p. 563) found that Certuna (which is probably the same as cilional), though inferior to plasmoquine, possesses marked gametocidal power in malignant tertian malaria. His method of testing this power is described. MÜHLENS (p. 562) believes that Certuna (Bayer) is superior to plasmoquine as a gametocide in malignant tertian malaria. He

gives it after atebrin in doses of 0·03 gm. or more daily for at least three days. SIOLI (p. 563) increased the dose of Certuna to 0·07 gm. thrice daily for seven days. Cure is not obtained.

HILL and GOODWIN (p. 561) report very favourably on prontosil in 93 cases of *falciparum* and 7 of *vivax* infections. It was given intramuscularly, 10 cc. every 12 hours. More than four injections were seldom necessary and it acted particularly rapidly if symptoms were severe. DÍAZ DE LEÓN (p. 561) treated 15 cases of benign tertian infection with rubiazol (prontosil) with completely satisfactory results. It was usually given by the mouth. READ and PINO (p. 562) on the other hand, consider that sulphonamide in benign tertian malaria has a poor specific antimalarial action. MOTZFELDT (p. 896) treated two patients undergoing a course of therapeutic malaria with proseptasine, with good results. He states that all three principal forms of malaria are equally amenable to treatment by sulphanilamide but reserves opinion on the general use of this as a specific remedy.

GLYN-HUGHES, LOURIE and YORKE (p. 658) found that n-undecane 1–11 diamidine had a beneficial effect in human malaria, especially on the asexual forms of parasites. They do not, however, recommend the drug for treatment.

SAUTET (p. 30) reports that dihydroquinamine, though useful by intramuscular injection, produced nausea and gastralgia. By the mouth it was ineffective.

CABRAL (p. 31) treated 13 patients with M3, a double iodide of mercury and manganese combined with spleen extract. It is not a reliable gametocide but may improve general nutrition and anaemia and reduce the spleen. Symptoms of intolerance were observed in half the cases.

RADVAN *et al.* (p. 34) discuss the action of acaprine, with which they obtained favourable results in malarial splenomegaly. Its effects resemble those of adrenalin.

Ascoli's method.

Page	Author	No. treated	Results and remarks
35	Marcialis *et al.*	15	Splenomegaly in children. Satisfactory.
565	Monaco *et al.* ...	6	Very satisfactory in all.
566	Acanfora ...	5	Chronic. Very satisfactory in all.
658	Pizzillo ...	6	Acute. Adrenalin with quinine. Very satisfactory in quinine-resistant infections.
893	Milletari ...	70	Great value in splenomegaly and on patients' general condition.
893	Mosna	9	Chronic splenomegaly. Good results in all.
893	Bell	6	Good results in all.
895	Nucciotti ...	10	Primary attack treated with quinine. Then adrenalin. Three febrile relapses. Several parasite relapses.
895	Nucciotti ...	6	Adrenalin no effect on crescents.

From this table it is seen that the results of adrenalin treatment are usually good. Marcialis administers it by intramuscular injection

in small children. The infections of Monaco's cases included *vivax*, *falciparum* and *malariae*, those of Nucciotti's series were all *falciparum*. Otherwise the infections are not stated in the abstracts.

TIMPANO (p. 104) describes the method of using the treatment in malaria and kala azar. Good results were obtained in both. The adrenalin is given 1 to 2 hours after quinine (or the antimony compound) if this is given by the intramuscular route. If by the intravenous method, the adrenalin is given at the same time.

GOSIO (p. 188) describes the measurement of the spleen by radioscopic methods. The adrenalin treatment is specific for the *stato malarico*. PIZZILLO (p. 566) describes the form and rhythm observed in the changes of size of the spleen during the process of reduction under the Ascoli treatment.

Other methods.

LORANDO and SOTERIADES (p. 35) in Greece treated 20 more children suffering from malaria [their earlier paper dealt with 23 cases], with subcutaneous injections of maternal whole blood which presumably contains immune bodies. In some cases small doses of quinine were given also, but in 9 haemotherapy alone was used. In all cases the treatment was successful, with a rapid fall in temperature and reduction in the size of the spleen. Many remained free from fever for a long period although living where reinfection is inevitable. [See also this *Bulletin*, 1937, Vol. 34, p. 63.] ARACTINGI (p. 31) treated 100 patients (principally with *vivax* infections) with subcutaneous injections of their own blood in 10 cc. doses at 3 to 5 days' interval, to a total of 40 cc. The blood was taken and injected during fever free periods and the treatment was conceived on the supposition that at such times the blood contains a toxin which, injected, leads to the formation of antitoxin. In 80 of 100 patients fever ceased after the third injection and no relapses occurred during seven months. In 15, fever ceased after the fourth injection and reappeared slightly after three weeks. In 5, no benefit was seen.

Prophylaxis.

(*a*) *Drugs.*

Opinion as to the value of drug prophylaxis is somewhat divided but favourable reports are given. It seems probable that regular drug taking leads to increased susceptibility if the drugs are discontinued. This may be due to loss of immunity.

PARROT *et al.* (p. 422) found that the daily administration of quinine reduced spleen rates and brought parasite and gametocyte rates to zero. Quinacrine was less successful, probably owing to under-dosage. In both the gametocyte rate followed the curve of the parasite rate and the authors think that both drugs have some action on young gametocytes.

MEZINCESCU *et al.* (p. 422) in 1935 observed a village of 271 inhabitants. In 101 given atebrin prophylactically the parasite index was 1·9 per cent.; in 99 given quinine 1·8 per cent.; in 71 controls 15·1 per cent. There were practically no cases of clinical malaria in the treated groups. In 1936 no drugs were given in this manner and in the atebrin group there were 33 cases of malaria, in the quinine group 26, and in the controls 13. FIELD, NIVEN and HODGKIN (p. 36) gave atebrin (0·2 gm. on two successive days of each week) and quinine bihydrochloride (0·4 gm.

daily) to two groups of persons on a plantation in the Federated Malay States. A third group acted as control. Smaller doses were given to children. The groups were observed for 15 months and during the last six the reduction in malaria in the treated groups amounted almost to elimination, but when the drugs were stopped malaria rapidly reappeared and was almost twice as frequent in the treated groups as in the controls. The action of the drugs was, in effect, to prolong the incubation period up to as long as one year. Atebrin was more potent than quinine and the risks are very slight.

RACHINA *et al.* (p. 33) conclude that the usefulness of both acriquine and quinine prophylactic courses is most evident if they are begun a few days before the annual wave of benign tertian relapses. Acriquine is rather more successful than quinine. HILL and GOODWIN (p. 37) in America treated groups with atebrin (1½ grains thrice weekly) and quinine (10 grains daily). The percentages of new infections were : atebrin group 1·8, quinine group 5·5, control group 31·6. LAVERGNE (p. 562) considers the synthetic remedies better than quinine for collective prophylaxis.

CLARK and KOMP (p. 806) in Panama found that quinine, atebrin and plasmoquine prophylaxis does not give promising results. Carriers are missed at each survey and are enough to keep up transmission. Some natural immunity may be destroyed by treating subclinical cases. Immediate treatment of clinical cases is a most useful measure where the elimination of Anopheles is impossible.

FARINAUD and MOREAU (p. 187) find in Indo-China that in a few areas of moderate endemicity, with a marked and limited seasonal prevalence, the use of synthetic remedies as the sole measure of prophylaxis has given good and lasting results. In hyperendemic areas they are insufficient, and almost continuous treatment is neither practicable nor desirable.

MOSNA and CANALIS (p. 28) in a well controlled experiment, found that atebrin administered, 0·2 gm. twice weekly (adult dose), to a section of the population of a village in Sardinia, appeared to exert a very considerable prophylactic influence both during the period of administration and for six months afterwards. Daily atebrin was also successful but to a lesser extent. WINCHESTER (p. 567) in the Southern United States gave atebrin daily to 426 persons. No malaria occurred in the season but in a control group of 202 the incidence was 24·3 per cent. Parasite carriers were not found in the prophylactic group but in the control group they numbered 19·8 per cent. The common infection is *falciparum*. JALALYAN and KARASEVA (p. 33) found that 3·1 per cent. of 127 persons taking atebrin had attacks of malaria as against 13·2 per cent. of 114 controls.

WINCHESTER (p. 658) considers that using atebrin one can control, if not eradicate, malaria in the Southern United States, but that anti-mosquito and anti-larval measures should also be used. HOOPS (p. 659) in Malacca, gives two tablets of atebrin twice weekly for four weeks and two tablets once weekly thereafter. This can suppress clinical manifestations where anti-larval measures are only partially effective.

OGANOV *et al.* (p. 32) found that 0·4 gm. acriquine given every 10 days had a good prophylactic effect. By successfully suppressing clinical symptoms, which are bound up with the appearance of gametocytes, it may be used to lower the infectivity of mosquitoes. SICAULT and MESSERLIN (p. 421) remark that for clinical prophylaxis

among a population living in a moderate or severe endemic zone, and consequently premunized, it suffices to treat the children and the sick. Quinacrine and praequine are given every 8, 10 or 15 days according to the intensity of the prevalence of anophelines and of gamete carriers. In insufficiently premunized communities threatened with unusual outbreaks the whole population should be treated in the same way. The state of premunition is determined by the relation of the parasite index of children to that of adults and by the splenometric index.

CIUCA *et al.* (p. 899) found that with a six months' atebrin and plasmoquine prophylactic treatment 1·3 per cent. of the treated and 6·1 per cent. of the untreated or irregularly treated suffered from malaria. Splenic, splenometric and parasite indexes had fallen considerably at the end of a six months' course and were considerably lower than before the experiment after a period of two years, during which only clinical cases were treated. SICAULT and MESSERLIN (p. 421) in Morocco, for the eradication of malaria give quinacrine 0·3 gm. and praequine (plasmoquine) 0·03 gm. weekly to all infected persons identified either clinically, serologically or haematologically. Anti-larval measures are also conducted. BUONOMINI (p. 810) found that atebrin and plasmoquine administered each Saturday and Sunday in Italy gave encouraging results. Clinical attacks were less frequent in the treated group than in the rest of the population.

Senior WHITE and ADHIKARI (p. 567) report that no delay caused by malaria was experienced in a labour camp where each person received a course of atebrin followed by a weekly dose of plasmoquine. Previously malaria had been a serious matter.

FARINAUD (p. 562) found in Madagascar that two courses of quinacrine and rhodoquine cleared the blood of 94 per cent. of children, who had previously shown parasites, when examined up to one month after completion of the treatment. DUPOUX *et al.* (p. 566) gave premaline (a tablet containing quinacrine, rhodoquine and praequine) regularly to 27,097 persons in Tunis over a period of 5½ months. Spleen, parasite and gamete indices fell remarkably and clinical relapses were rare. The authors are enthusiastic about the results.

CHOPRA and BASU (p. 569) found that plasmoquine in doses of 0·02 gm. was effective in preventing the development of crescents in *A. stephensi*, but atebrin and malarcan prevented the development of gametocytes of *P. malariae*, and quinine arrested development of oöcysts in *vivax* infections. TIBOURSKAJA (p. 35) advocates that all gametocyte carriers should be given 0·03 gm. plasmocide thrice daily every third day until a few days after the gametocytes have disappeared, in order to render them incapable of infecting mosquitoes.

(*b*) *Other measures.*

General.—DECOURT (p. 898) discusses the "limit of benignity," or the degree of malaria infestation above which pernicious forms appear. In most regions there are "virulent areas" which maintain dangerous strains of parasites and conserve active malaria. Antiplasmodial measures should include chemoprophylaxis for the virulent areas and areas of moderate endemicity, sanitary barrages, the search for and treatment of cases, and hygienic prophylaxis. EARLE (p. 21) shows that in Porto Rico the malaria prevalence was not affected until the mosquito density had been brought down to, and maintained at, an extremely low figure. SICAULT and MESSERLIN (p. 421) realize that in

Morocco attempts at the eradication of malaria are only possible in places where anopheline infestation is moderate and the disease not widespread.

ROUBAUD (p. 568) shows that improvement in housing conditions and social progress favour the development of zoophilic deviation of Anopheles. This deviation is a vast biological phenomenon and the first necessity seems to be a general transformation in the conditions of human life. GROOTINGS (p. 903) advocates, in those parts of the Dutch East Indies where increased malaria has followed house improvement inaugurated as a protection against plague, that drainage channels and the water surface of ponds should be cleaned, sawaks should be drained and dried and stalks cut and burned after the harvest, fish should be introduced to eat pond vegetation and possibly that mosquito curtains should be distributed. The Malaria Advisory Board of the Federated Malay States (p. 20) draws attention to the necessity for filling in holes left by uprooting trees on rubber estates.

CORRADETTI (p. 573) in Italy, found that *A. elutus* was present in abundance where bonification had either not been, or had only imperfectly been carried out, and its prevalence diminished in direct proportion to the progress in bonification achieved.

DE PALMAS and SAINZ (p. 261) detail the measures which succeeded in converting a very unhealthy military post in Tonking into a comparatively healthy station. These include clearing and levelling, drainage and oiling, the use of mosquito nets and prophylactic quinine.

WATSON and SPAIN (p. 188) in Alabama think that the creation of lakes by the impounding of the water of the Tennessee would lessen rather than increase malaria transmission if modern anti-larval measures are carried out through the breeding season. CARR (p. 900) reports that the shading of watercourses by planted *Ficus benjamina* is an important measure in the eradication of larvae of *A. albimanus* in Cuba.

HILL (p. 23) in Portugal records that intermittent irrigation of rice fields has proved successful experimentally in the control of breeding, but screening of labour barracks and improvement in agricultural methods are necessary. SMALT (p. 427) found in Bali that draining rice fields for two successive days every nine days reduces the number of larvae of *A. aconitus* to one-third or less of the figure found previously without serious loss of produce. SCHARFF (p. 96) finds sluicing or flushing and agitation of the water surface to be useful measures of control in Malaya.

Drainage.—RECTOR (p. 812) describes control in Mississippi. Ditch lining receives most attention. A round bottom invert with the banks of the ditch covered with Bermuda sod gives the best results. Wood ash is used as a fertilizer for the sod. HARKNESS and SAMAHA (p. 96) used dynamite in the excavation of drainage canals in Palestine. They describe the method, which is not suitable for dry soil or semi-liquid marsh. Excavation by hand labour costs ten times as much.

Oiling.—WATSON (p. 258) considers that the killing power of a larvicide may be best estimated by noting the interval which elapses between the entry of oil into the breathing tubes and the moment when the heart muscle finally ceases to contract. This may be determined by the cessation of tracheal movements. Paris green behaves in larvae, as in man, as a gastro-intestinal poison. MURRAY (p. 654) discusses the stability of oil films. The conclusions cannot be further abstracted. MANSON (p. 811) describes a method of oiling streams in

Assam which consists of an oiled gunny mat which is unrolled on to the surface of the water. The method is cheap and effective.

Dusting.—BRASIER-CREAGH (p. 725) describes the dusting with Paris green of flooded land near Delhi by means of a D.H.83 Fox Moth aeroplane. Slow and low flights should be made and the pilot should know the ground and the day to day changes in the position of the flood water. WATSON, KIKER and JOHNSON (p. 512) find that aeroplane dusting of Paris green is useful in somewhat open water with low emergent vegetation, but not where there is dense horizontally locking vegetation. The usual height of flying is 25 feet. KIKER *et al.* (p. 805) show that one pound of Paris green per acre in a 20 per cent. by volume mixture, gave good results when distributed from an aeroplane on Lake Wheeler, Tennessee. It is not successful in areas of dense vegetation. RAO and SWEET (p. 97) used 1 per cent. of Paris green in road dust and wood ash for dusting rice plots in Mysore. Over a period of three years no evidence was found of any adverse influence on the yield of rice or straw.

PIVOVAROV and GUTERMANN (p. 512) describe the results of using anabasine, a powder insecticide of the nicotine type. KALANDADZE and LEMER (p. 573) investigated chloropicrin as a larvicide. It is successful when used to moisten sawdust which is then broadcast. It is expensive.

Larvivorous fish.—MORIN and MARTIN (p. 38) give practical details concerning larvivorous fish. They are seldom adequate alone, but form a valuable supplement to other measures such as the use of Paris green. MORIN and MOREAU (p. 186) consider that small larvicidal fish may be of great value in the centre and south of Annam, but that in the north larger omnivorous varieties are necessary. COLLIGNON *et al.* (p. 261) report that increased attention is being paid to Gambusia as a larvicide in Algeria.

Spraying.—COVELL, MULLIGAN and AFRIDI (p. 901) report very encouraging results from the regular spraying of native houses with Pyrocide 20 diluted with 19 times its volume of kerosene. At first 2 cc. per 1,000 cubic feet of air space was used, later the quantity was halved. Rooms were closed for half an hour after spraying. Various communities and two villages were treated in this fashion twice a week or oftener. Cowsheds were also sprayed. The results (which are given in the abstract) were remarkably good and the cost was about fourpence per head for the malaria season. GINSBURG (p. 260) reports favourably on the protection of outdoor gatherings against mosquitoes by the production of a cloud of atomized dilute emulsified kerosene pyrethrum extract.

Screening.—BLACKLOCK (p. 259) points out that since a certain proportion of *A. funestus* and *Aëdes* can pass through a 14-mesh screen-cloth made of wire of 30 Imperial S.W.G., it is unsafe to use this gauze without experimental proof of its efficiency in each locality. CHMÉLOVA and SCHLONOVA (p. 36) found in Russia that the use of metallic screening combined with mosquito nets gives considerable protection, but the necessity of killing all adult mosquitoes in dwellings should not be overlooked. BESSLER (p. 656) compared 19 metallic gauzes over a period of 7 years. The best results were seen with steel, aluminium, bronze "Monel" metal and galvanized iron. All were durable except galvanized iron, even in coastal regions.

GORE (p. 199) describes a simple mosquito trap.

Research.

CIUCA *et al.* (p. 26) dissected infected salivary glands of Anopheles in solutions of basic quinine and atebrin, each in 1 in 2,500 concentration. The sporozoites were in contact with the drugs for 15 minutes. One patient of four in the atebrin, and two of four in the quinine experiment became infected after receiving injections of the suspensions.

RAFFAELE (p. 100) shows that the blood of canaries injected intravenously with large numbers of sporozoites of *P. praecox* is not infective until after three days. Human findings are similar. The sporozoites probably enter the reticulo-endothelial cells.

MISSIROLI (p. 569) from observations on the (so called) sporozoites of *P. praecox* (*relictum*) injected into canaries concludes that they are in reality immature sporocysts which continue their development in the lymph spaces and give rise to sporozoites, not more than eight from each.

YOELI (p. 732) has succeeded in infecting Anopheles by inducing them to feed through a membrane prepared from the skin of a rabbit's ear stretched over a tube containing gametocytes in defibrinated blood kept for five hours at 23 to 27°C., or for 72 hours in the ice box.

GARCIA (p. 816) for the study of parasites puts up malaria infected blood as for culture and keeps it at 10°C. instead of 37°C.

SIMONS (p. 814) describes a rapid method of staining blood films in which saponin is used for haemolysis and methylene blue for staining. MATUMOTO and HIRASIKI (p. 815) describe a method for the simultaneous staining of large numbers of films.

Malaria in Monkeys and Birds.

MOSNA (p. 731) tested various African monkeys as hosts for *P. knowlesi*. None was as satisfactory as the Indian *M. rhesus*.

JOLLY, LAVERGNE and TANGUY (p. 107) found the cycle of *P. knowlesi* to be 20 hours instead of the usually accepted 24. Passage through man reduces the virulence so that in *Cynocephalus papio* only mild chronic infection is produced.

RODHAIN and VAN DEN BERGHE (p. 107) describe *P. gonderi* of monkeys which, in view of its 72 hours cycle, they regard as a distinct species. SINTON had previously regarded it as the variety *gonderi* of *P. inui*.

RODHAIN and MUYLLE (p. 816) failed to infect three patients with the *vivax* (one patient) and *falciparum* (two patients) types of the species of Plasmodium of chimpanzees, though no difficulty was found in the transmission of infection to other chimpanzees.

WEYER (p. 107) found that complete development of *P. knowlesi*, *P. cynomolgi* and *P. inui* takes place in *A. maculipennis*, although injection of apparently normal sporozoites from the salivary glands did not produce infection. The reason for this is not clear.

MALAMOS (p. 108) studied immunity in monkeys. A high degree of acquired immunity can be produced by repeated super-infections. It is strictly specific and limited to homologous strains of the same parasite. It breaks down if splenectomy is performed or if the R.E.S. is blocked but even then it may be produced by reinfection, and disappears after treatment and complete eradication of the parasites to the extent that reinfection can be carried out, but the decreasing intensity of subsequent infections in certain cases indicates that some degree of immunity remains. Natural immunity is very rare. DAS

GUPTA (p. 732) found that in monkeys immunity to *P. knowlesi* persisted only as long as parasites remained in the body. With complete eradication of infection the immunity was lost.

COGGESHALL (p. 109) found in monkeys that the greatest degree of splenomegaly was associated with the milder and more slowly developing infections and was accelerated by repeated injections of parasites.

MALAMOS (p. 108) noted auto-agglutination of red cells in one of 200 monkeys infected with *P. knowlesi*. A large number of the cells in each clump contained half-grown parasites. The phenomenon persisted after atebrin treatment.

COGGESHALL and KUMM (p. 109) demonstrated that the serum of monkeys with chronic infection has a depressing effect on the course of the disease if injected into monkeys with an acute attack. [See also LORANDO and SOTERIADES above.]

MANWELL (p. 731) working on cross immunity with nine species of bird malaria parasites found that *P. elongatum* did not protect against any other, and conversely. Four small parasites like *P. rouxi* protected against each other and against *P. cathemerium*, but not against *P. praecox*.

MANWELL and HEWITT (p. 104) cultured *P. praecox* of birds in capillary tubes at 25°C. A small quantity of heparin was added to prevent coagulation.

BRUMPT (p. 105) gives a list of birds susceptible to and of those refractory to infection by *P. gallinaceum*. In fowls up to 90 per cent. of red cells may harbour parasites without there being signs of illness until about two days before death. *Aëdes aegypti* and *Aëdes albopictus* are vectors. KIKUTH (p. 729) confirms the work of BRUMPT on *P. gallinaceum* and its development in *Aëdes aegypti*. He observed the pigmentless schizonts described by JAMES and TATE in *P. gallinaceum*, *P. cathemerium* and *P. praecox* infections. The number found bears no relation to the intensity of the infection. They may be found in the brain, kidney, lung, liver, heart and bone marrow, 72 hours after sporozoite injection. KIKUTH and MUDROW (p. 729), however, state that the number of these forms in the internal organs increased with the severity of the blood infection. They do not think that these schizonts belong to parasites other than those of malaria. RODHAIN (p. 899) found endothelial non-pigmented schizonts in penguins in Antwerp infected with *P. praecox*. These occur not only in the fixed endothelial cells but also in the monocytes and histiocytes of the blood and the author considers them to be derived directly from the sporozoites of mosquito infection. BRUMPT (p. 104) considers that the irregularity of the occurrence of schizonts of *P. gallinaceum* within endothelial cells points to accidental ingestion rather than an essential stage in development.

HEGNER and WOLFSON (p. 730), however, consider that further work is necessary before it can be concluded that endothelial schizonts actually belong to the malarial parasites and not to toxoplasms, which are relatively common parasites of birds.

GAMBRELL (p. 729) studied gametogenesis in *P. cathemerium* and *P. relictum* var. *matutinum* infections. Pregametocytes appear at each schizogony (which takes place at 24 hour intervals) and reach maturity 6 to 10 hours later. Strains vary in their capacity to produce gametocytes. A strain started from a single cell by STAUBER produced

gametocytes in the normal manner, showing that they are offshoots of asexual forms.

CHORINE (p. 730) found in fowls infected with *P. gallinaceum* a slight diminution in blood euglobulin and a marked increase in pseudoglobulin. In human malaria there is a great increase in euglobulin.

MISSIROLI (p. 104) showed that sporozoites of *P. praecox* (*relictum*) from the body cavity and mature malarial cysts of mosquitoes are infective. Maturation in the salivary glands is therefore not necessary, but SANDICCHI (p. 816) points out that in the dissection of mosquitoes heavily infected salivary glands may rupture and liberate mature sporozoites into the body cavity. This may explain why sporozoites from the body cavity have been held to be infective.

OESTERLIN (p. 103) found that the activity of methylene blue, which is a gametocidal agent, is due to its action on the respiratory metabolism of the cell; that of plasmoquine is increased by products, *e.g.*, glucose, which play an important part in cell respiration; that of quinine is unaltered by the addition of such respiratory metabolic products. These studies were made in birds. ALBRICHT and NIEUWENHUYSE (p. 106) found that methylene blue (intramuscularly) combined with quinine is much more effective in *P. praecox* infection of birds than quinine alone. He suggests its use in human malaria.

BUTTLE *et al.* (p. 731) found that changes in the vinyl side chain in quinine and quinidine do not alter the antimalarial action, but that any interference with the central -CHOH- group partially or completely destroys it.

COGGESHALL (p. 897) found that sulphanilamide was capable of preventing the onset of malaria or of producing a chronic low grade infection in *rhesus* monkeys infected with *P. knowlesi*, and was useful in prophylaxis. Sulphanyl-sulpanilate has therapeutic, but no prophylactic value. Neither drug has any value in *P. cathemerium* or *P. lophurae* infections in canaries or young chicks. CHOPRA and DAS GUPTA (p. 900) found soluseptasine to be a specific for *P. knowlesi* infections in monkeys.

RODHAIN and HENDRIX (p. 106) found that "Paludex" had no favourable action in infections by *P. cathemerium*, *H. oryzivorae*, *P. knowlesi* and *P. gonderi*. *C. W.*

AMOEBIASIS.

Précis of Abstracts in this Section.

Massani (p. 283) describes an outbreak of amoebic dysentery on a torpedo boat. Two members of the crew were cyst passers.

Archetti (p. 283) notes that the disease is widespread in Italian East Africa.

Tchalaja (p. 284) shows that in culture the variation in the long and short diameters of vegetative amoebae extends from 5 to 48μ and 5 to 33μ respectively.

Pavlova (p. 284) found that locomotion and the formation of ectoplasmic pseudopodia cannot alone be used as differential criteria between *E. histolytica* and *E. coli*.

Deschiens (p. 284) finds that bilirubin, like haemoglobin, is a stimulant to the growth of *E. histolytica* in culture, but (with Dopter, p. 285) that bile at 1 in 1,000 dilution checks development and at 1 in 100 kills the amoebae. Bile salts and cholesterol similarly retard development.

Tsuchiya (p. 285) induced encystment of *E. histolytica* on Loeffler's slants covered with Ringer's solution to which starch is added, but these cysts had apparently lost in culture their pathogenicity for kittens. Pavlova (p. 286) describes simple and efficient culture media of salt phosphate buffer solution, horse serum and starch. Dopter and Deschiens (p. 286) show that *E. histolytica* grows much more easily on coagulated horse serum slopes when human serum is added to the Ringer's solution with which the slopes are covered. Serum from amoebic dysentery patients is only half as good as that from normal persons, but serum from jaundiced patients is better than normal.

Pavlova (p. 287) found that in culture *E. histolytica* only ingested human red cells between *p*H 5·6 and 6·5. Findings suggested that thermolabile factors inhibiting phagocytosis exist in horse serum. Deschiens (p. 287) found that the pathogenicity for cats of *E. histolytica* maintained in culture is 50 per cent. between 56 and 124 days and only 20 per cent. between 542 and 652 days. This loss is attributed to changes in the accompanying bacteria.

Westphal (p. 288) considers that *E. histolytica* is capable of both intra- and extra-cellular digestion. Proteolytic ferments, but no toxins, are produced. Normally it exists as a harmless amoeba in the lumen of the gut (*minuta* form) and the extent to which it may become pathogenic depends on the tissue resistance of the host, which may be broken down by bacteria. In the tropics conditions favour the reproduction of *E. histolytica* and virulent strains therefore ensue. Benzoni (p. 289) also accepts the view that it is normally harmless.

Swartzwelder (p. 290) showed that unencysted *E. histolytica* could produce dysentery in dogs when administered by the mouth. Gastric juice was therefore not an efficient barrier. Deschiens (p. 290) showed that a strain of *Bact. coli* capable of producing simple enteritis in cats increased, when added to a culture of *E. histolytica*, the virulence of that organism more than twofold. The simple enteritis is apparently a predisposing factor. He (p. 290–291) further showed by animal experiment that certain groups of bacteria enable *E. histolytica* to give rise to amoebic dysentery and supports this view by epidemiological observations. Similarly Deschiens and Decourt (p. 292) found that a toxic enteritis caused by croton oil

favoured the establishment of the amoeba in the cat's intestine. GAUDUCHEAU (p. 292) transformed latent amoebic infection into dysentery in animals by inoculating a bacillus and a virus.

SARKISSJAN (p. 292) concludes from experiments that amoebae from symptomless carriers are identical with pathogenic *E. histolytica*.

FRYE and MELENEY (p. 293) conclude from experiments that a small race of *E. histolytica* exists which is relatively fixed in its size and activity and that it possesses a low power of invasion of the tissues of man and experimental animals.

WILKINSON (p. 293) concludes that sigmoidoscopy is useful for the confirmation of diagnosis in a small proportion only. BONSIGNORE (p. 294) uses a histidine cutaneous test. It is positive in chronic cases and is reduced by treatment. He infers that there is a distinct affection of general and local protein metabolism. PAULSON and ANDREWS (p. 294) found that the complement fixation test is unreliable in the individual case and not so valuable as microscopic faecal examination. CRAIG and SWARTZWELDER (p. 294) found that four monkeys infected with *E. histolytica* all gave positive complement reactions. This result did not agree with previous findings by MELENEY and FRYE.

MANSON-BAHR (p. 295) found *E. histolytica* in the discharge from the ulcerated abdominal wall around a colostomy opening. Emetine and yatren treatment was successful and the colostomy wound was finally closed. PIERI *et al.* (p. 295) discuss a case of a cyst of the lung associated with, but not proved to be caused by, an amoebic liver abscess. WU (p. 295) found amoebae in a nasopharyngeal polyp. Fusiform bacilli were also present. It could not be decided whether the amoebae were *gingivalis* or *histolytica*. LOUBEYRE *et al.* (p. 296) describe a patient whose neuritis (with paralysis) cleared up when emetine was given for an attack of amoebic dysentery.

SAUTET (p. 296) points out that obscure hepatic conditions in the tropics and subtropics are often due to amoebiasis. Previous history of dysentery does not always occur.

HUARD, LONG and GRAZIANI (p. 296) describe a series of 48 liver abscesses, of which only three were amoebic, seen in Indo-China. Open operation was the usual treatment in the bacterial cases, but in amoebic cases they give emetine intravenously and use adrenalin to counteract depressant effects. A table of mortality from many authors is given. WIJERAMA (p. 298) records 48 patients of liver abscess of whom 34 gave a history of previous dysentery. Treatment with emetine with or without aspiration was very successful. One died after operation. PEIRIS (p. 298) describes the clinical picture in 28 cases of liver abscess. Treatment was by emetine and aspiration. The commonest complication of untreated abscess was rupture. BROWN and HODGSON (p. 299) found that 18 per cent. of liver abscesses at the Mayo clinic were due to amoebiasis. They give the symptoms, methods of diagnosis and treatment, and stress the importance of emetine. TRABAUD and RABÏE (p. 300) describe the symptoms in a case of amoebic hepatitis. These disappeared under emetine treatment, but an increasing leucocytosis remained, possibly indicating abscess.

DAVIS (p. 300) records a patient whose symptoms and X-ray suggested a pneumonic condition. No fluid was found in the pleural cavity and faecal examination was negative. Treatment was unsuccessful until emetine was tried as a shot in the dark, when rapid improvement occurred.

MATTEI (p. 301) details the alimentary, urinary and circulatory premonitory symptoms of emetine poisoning. Polyneuritis and cardiac insufficiency are symptoms of established poisoning. He recommends caution in dosage.

HAKANSSON (p. 302) gives the results of treatment with Carbarsone. An intensive 10 day course in which 5 to 10 gm. were given in all produced the best results. GRASSO (p. 303) recommends 75 mgm. per kilo. body weight over a period of at least 10 days in the use of Fenarsone (the Italian equivalent of Carbarsone). The drug is valuable. PYMAN (p. 303) tested derivatives of harmol as amoebicides in cultures and in animals. They are less effective than emetine in the treatment of amoebic infections.

HILLEMAND and GAUBE (p. 304) deal with treatment in general.

BONNIN and ARETAS (p. 304) found that emetine resistance could be induced by growing *E. histolytica* in media containing emetine. This persists to some extent after 10 subcultures in emetine-free media. VALETTE and ROLLÉ (p. 304) observed by ultraviolet illumination that quinine enters *Amoeba dubia* and fixes itself to certain inclusions or vacuoles in greater concentration than in the surrounding solution.

DESCHIENS and PROVOST (p. 305) experimentally infect cats directly into the ileum during laparotomy. *C. W.*

MASSANI (R. M. Mario). Osservazioni su di una piccola epidemia di amebiasi intestinale manifestatasi a bordo di una torpediniera. [**A Small Outbreak of Amoebic Dysentery on a Torpedo-boat.**]—*Ann. di Med. Nav. e Colon.* 1938. July–Aug. Vol. 44. No. 7–8. pp. 301–305.

At the end of September 1937, on two successive days a patient from a torpedo-boat reported sick with symptoms of dysentery, and examination of the stools revealed *E. histolytica*, both vegetative and cyst forms. Examination of others of the ship's complement showed nine to be infected, and details of each of these are given. Five of them presented definite symptoms, passing mucus and blood, one merely ordinary diarrhoeic stools, three appeared to be in good health, but were cyst-passers. Two of the last had suffered from gastro-intestinal disturbance in Cirenaica previously. When these patients were properly dealt with no further cases occurred. To avoid such occurrences it is suggested that care should be taken to examine those who have lived in Africa before being accepted in the service, to keep a record of those who have suffered from amoebiasis clinically and been cured, to examine such periodically, and particularly to keep watch on those engaged in the handling of food. *H. H. S.*

ARCHETTI (Italo). Considerazioni sull'amebiasi nelle terre dell'Impero. [**Amoebiasis in Italian East Africa.**]—*Riv. di Biol. Colon.* Rome. 1938. Aug. Vol. 1. No. 4. pp. 281–291. [13 refs.] English summary (2 lines).

The author has collected from the literature records of cases of infection by *E. histolytica* in those parts of East Africa which are under Italian rule. He shows that the distribution is not only widespread but in places also fairly intense. The article contains no original observations. *H. H. S.*

SORGE (Giuseppe). Epidemiologia e profilassi dell' amebiasi. [**Epidemiology and Prophylaxis of Amoebiasis.**]—Reprinted from *Med. Internazionale.* 1938. Apr. No. 4. 18 pp. [64 refs.]

TCHALAJA (L. E.). [**Morphological Study of a Pure Line of** *Entamoeba histolytica* **in Culture.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 1. [In Russian pp. 95–109. With 15 figs. on 2 plates & 3 diagrams. French summary p. 109.]

The author records the results of a detailed morphological study of a pure line strain of *Entamoeba histolytica* grown in culture, on a fluid "cardiac" [?] medium. From measurements of stained specimens taken at different intervals the long and short diameters of the vegetative amoebae were found to vary from 5 to 48μ and 5 to 33μ respectively (mean 21×15μ). The amplitude of variation in the dimensions increased with the age of the culture, the maximum coinciding with a higher rate of multiplication of the amoebae. The nucleus varied in size (diameter) from 2 to 7μ. The majority of nuclei had the typical structure; deviations from this structure are attributed to the physiological state of the organism. The paper is illustrated by graphs and figures. *C. A. Hoare.*

PAVLOVA (E. A.). [**Comparative Study of Locomotion in** *Entamoeba histolytica* **and** *E. coli.*]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 1. [In Russian pp. 110–118. With 8 figs. French summary p. 118.]

Working with cultures and faecal forms the author has made comparative observations on the locomotion of *Entamoeba histolytica* and *E. coli* under various conditions, the object being to ascertain whether locomotion can serve for the differential diagnosis of these species. In the case of both amoebae it was found that the greatest activity was manifested at *p*H 6·5, the rate of locomotion being higher at body temperature than at room temperature. Neither of the amoebae, when freshly isolated from the faeces or culture and observed at 37°C., showed a sharp differentiation between ectoplasm and endoplasm, and locomotion in both took place without the formation of hyaline pseudopodia. On the other hand, amoebae of both species produce such pseudopodia some time after isolation, *E. histolytica* retaining its motility and pseudopodia for a longer period than *E. coli*, on account of which the formation of these ectoplasmic outgrowths is more commonly attributed to the dysentery amoeba. It is concluded that the differential diagnostic importance of ectoplasmic pseudopodia is only relative and can only be used if allowance is made for the freshness of the material, and in conjunction with other characters. The movements of the amoebae are illustrated by a series of figures. *C. A. Hoare.*

DESCHIENS (R.). Affinité alimentaire de l'amibe dysentérique pour la bilirubine. [**Alimentary Affinity of the Dysentery Amoeba for Bilirubin.**]—*Bull. Soc. Path. Exot.* 1938. July 6. Vol. 31. No. 7. pp. 626–635. With 2 figs. on 1 plate.

The author finds that the addition of bilirubin in crystalline form or in solution to culture medium for *E. histolytica* is a stimulant to growth.

Moreover the amoebae ingest with avidity the crystals, which appear to be utilized as a nutriment. If both rice starch and bilirubin are added to the culture tubes the cultures behave, as regards development of the amoebae, with a great regularity. The stimulating action of bilirubin is compared with that of haemoglobin, which has also been shown by the author to be beneficial to growth. The liking of the amoebae for bilirubrin may explain to some extent the frequency of amoebic abscess of the liver in connexion with amoebic dysentery.

C. M. Wenyon.

DOPTER (Ch.) & DESCHIENS (R.). Action de la bilirubine et de la bile totale sur les amibes dysentériques. [**Action of Bilirubin and of Bile on Dysentery Amoebae.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 30. pp. 626–628.

The authors find that the addition of bilirubin in crystalline form or in solution to culture media for the growth of *E. histolytica* has a stimulating action on the amoebae. Bile, on the other hand, in concentrations of 1 in 1,000 upwards checks the development, while with a concentration of 1 in 100 all the amoebae are killed.

C. M. W.

DOPTER (Ch.) & DESCHIENS (R.). Action des sels biliaires et du cholestérol sur les cultures d'amibes dysentériques. [**Action of Bile Salts and Cholesterol on Cultures of Dysentery Amoebae.**]—*C. R. Soc. Biol.* 1938. Vol. 129. No. 30. pp. 628–632.

Having shown that bilirubin acts favourably on *E. histolytica* in culture, while bile has the opposite effect, it seemed of interest to test the action of bile salts and cholesterol. It was found that these substances did not stimulate the growth of the amoebae and in certain concentrations actually retarded development. It would appear therefore that the good effect on the growth of the amoebae of adding to the medium the serum from cases of jaundice, as previously reported, is attributable to the presence in such serum of bilirubin. *C. M. W.*

TSUCHIYA (H.). **Observations on Induced Encystment of** *Endameba histolytica* **in Vitro.**—*Jl. Lab. & Clin. Med.* 1937. Dec. Vol. 23. No. 3. pp. 261–266. [16 refs.]

The author shows that *Entamoeba histolytica* cultivated on S.C. medium, *i.e.*, nutrient broth, starch and charcoal with or without Dorsett's egg medium (see *Jl. Lab. & Clin. Med.*, 1933–34, Vol. 19, p. 495), in which encystment does not occur, will readily encyst when transferred to a medium consisting of Loeffler's slants covered with Ringer's fluid to which some starch has been added. The maximum encystation occurred after incubation at 37°C. for 48 to 54 hours. It was found that at refrigerator or room temperature uninucleate or binucleated cysts continue to develop to the 4-nucleate stage. At the same time the chromatoid bodies tended to disappear. Kept at 37°C. the cysts degenerated. Though apparently normal in every way, these

induced cysts orally administered failed to produce lesions in kittens or rats, though harmless infection with amoebae resulted in some cases in these animals. The original pathogenicity of the cysts from the human case, as had been proved by administration to kittens, had been lost on culture. As judged by their power to excyst in suitable media it was found that the cysts survived for 40 to 45 days at refrigerator temperature and for 6 to 8 days at room temperature. *C. M. W.*

PAVLOVA (E. A.). Sur les méthodes de la culture d'*Entamoeba histolytica.* [**Culture Methods for** *Entamoeba histolytica.*]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 2. [In Russian pp. 224–227. [16 refs.] French summary p. 227.]

The author maintains that for the successful culture of *E. histolytica* it is quite unnecessary to use complicated media with Locke or Ringer solutions or extract of heart muscle. A simple medium consists of a solution of sodium chloride to which is added a phosphate buffer such as that of SORENSEN at *p*H 6·5, horse serum to a strength of 1 in 20 and a little starch. In such a medium both primary cultures and subcultures succeed and the amoebae can be maintained indefinitely by subculturing every 72 hours. For each test tube the following quantities are used :—

1. Solution of NaCl 0·9 per cent. ... ... 9 cc.
2. Phosphate buffer of Sorensen *p*H 6·5 ... ... 2 cc.
3. Horse serum ... ... 0·5 cc.
4. Rice starch ... ... 1 loopful.

As an alternative the following may be employed :—

1. Disodium phosphate ($Na_2HPO_4.2H_2O$) ... ... 0·3564 gm.
2. Monopotassium phosphate (KH_2PO_4) ... ... 0·6354 gm.
3. Sodium chloride solution (0·9 per cent.) ... ... 1 litre.

After sterilization in the autoclave and distribution in quantities of 10 cc. in tubes, horse serum (0·5 cc.) and rice starch (one loopful) are added to each tube.

The cultures can be kept alive for longer periods than 72 hours if 0·5 cc. of buffer solution is added each day.

[Sorensen's standard phosphate buffer solution of *p*H 6·468 at 18°C. is made as follows :—

1. $Na_2HPO_4.2H_2O$ ... 11·876 gm. per litre.
2. KH_2PO_4 ... ... 9·078 gm. per litre.

Three parts of 1 to seven parts of 2.

(CLARK, W. M. The Determination of Hydrogen Ions. 1928. London, Baillière, Tindall and Cox, p. 210.)] *C. M. W.*

DOPTER (Ch.) & DESCHIENS (R.). Action comparée du sérum humain normal et du sérum humain ictérique sur les cultures d'amibes dysentériques. [**Comparative Action of Normal and Icteric Human Serum on Cultures of Dysentery Amoebae.**]—*C. R. Soc. Biol.* 1937. Vol. 126. No. 33. pp. 969–972.

Employing as culture medium for *E. histolytica* coagulated horse serum slopes covered with a mixture of serum and Ringer's solution

in the proportion of 1 to 7, to which 0·05 grams of sterile rice starch had been added for each tube, the authors have previously shown that the growth of amoebae is five times greater when the serum in the Ringer mixture is human serum than when it is horse serum. They have also shown that the growth in the presence of serum from cases of amoebic dysentery is only half as good as in the presence of normal human serum. In the present paper they describe tests on the action of serum from cases of jaundice which have shown that as compared with normal horse serum the growth of amoebae is six times as great. It has already been shown that amoebic growth is aided by the presence of haemoglobin, so that it is possible that the related bilirubin in the icteric serum is also a stimulant. On the other hand it may be that the increased cholesterol content is responsible for the better growth. This requires investigation. *C. M. W.*

PAVLOVA (E. A.). [**Factors affecting the Phagocytosis of Erythrocytes by *Entamoeba histolytica* in Cultures.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 1. [In Russian pp. 119–122. French summary p. 122.]

The author studied the effect of *p*H of the medium upon the capacity of *Entamoeba histolytica* to phagocytize human red cells, and tested FRYE and MELENEY's contention that heated horse serum favoured this phenomenon. A drop of culture medium with amoebae was mixed with a drop of saline emulsion of red cells, the reaction was set at different *p*H by the addition of HCl, $NaHCO_3$ or phosphate buffers and the preparations were examined at 37°C. It was found that the amoebae ingested the red cells only at *p*H 5·6 to 6·5, whereas no ingestion took place at higher values of *p*H. It is noted that this reaction corresponds to that found in human dysenteric stools and in the colon of experimentally infected kittens. The author confirmed the observation that heated horse serum when added to the medium was more favourable to the ingestion of the erythrocytes by the amoebae than fresh serum, thus pointing to the presence in the serum of thermolabile factors inhibiting phagocytosis. *C. A. Hoare.*

DESCHIENS (R.). Nouvelle observation de réduction du pouvoir pathogène pour le chat d'une souche d'amibes dysentériques en culture. [**Further Observations on the Loss of Virulence of a Strain of Dysentery Amoebae during Culture.**]—*C. R. Soc. Biol.* 1938. Vol. 127. No. 11. pp. 939–941.

The author refers to earlier experiments of various authors, including himself, who have shown that the virulence of *Entamoeba histolytica*, as judged by its power of producing infection when injected into the small intestine just above the ileo-caecal valve of cats, is decreased by continued cultivation in artificial media. In the present paper he shows that a strain of amoeba isolated from a case of dysentery in Morocco produced infection in 50 per cent. of cats inoculated when the culture had been maintained for 56 to 124 days and in only 20 per cent. when the culture period was 542 to 652 days. This loss of virulence is, in the author's opinion, probably associated with changes which occur in the bacteria which accompany the amoebae in the medium.

C. M. W.

WESTPHAL (Albert). Die Pathogenese der Amöbenruhr bei Mensch und Tier. I. Das Wesen der pathogenetischen Wirksamkeit der Ruhramöbe. II. Die Pathogenese der Amöbenruhr beim Menschen. [**The Pathogenesis of Amoebic Dysentery in Man and Animals. I. The Nature of the Pathogenic Action of Dysentery Amoebae. II. The Pathogenesis in Man.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1938. Aug. & Oct. Vol. 42. Nos. 8 & 10. pp. 343–349; 441–459. With 2 figs. [41 refs.]

There are two views generally held regarding the pathological processes in tissue invaded by *Entamoeba histolytica.*

One school believes them to be due to fermentative, the other to toxic action. The toxic theory is founded mainly upon the similarity of the necrotic processes in the surrounding tissues as observed in men as well as in animals.

Naturally, in assessing complicated interactions between host and parasite it is necessary to discount secondary infections and in the case of an *intestinal* parasite it is quite impossible to avoid them. It is only in bacteria-free metastatic abscesses that the true process can be observed and even here it is not quite clear whether the bacteria were originally present or were subsequently removed by the leucocytes. The best uncomplicated picture of tissue-invasion by amoebae is to be obtained from a study of the submucosa of the human large intestine. The penetration of the muscularis is effected through various gaps in the muscular fibres. The "nests" of amoebae flourish in the submucosal tissues, usually uncontaminated by bacteria and, as is well known, the cellular response to the presence of amoebae is minimal. The amoebae themselves lie in lacunae of histolysed cells, and it is worthy of note that this histolysis occurs in the absence of leucocytic infiltration and that necrosis follows, but does not *precede*, the amoebae. Tissue destruction is the result of fermentative processes and takes place in man and in animals in the absence of any parasites, but it is accompanied by leucocytic invasion which is not the case in amoebiasis, for even the exudate from the bowel is singularly free from leucocytes. We are driven to the conclusion that the amoebae are capable of *intra-* as well as *extra*-cellular digestion. The formation of actual channels in the invaded tissue can only be explained on the assumption that free *proteolytic ferments* are produced. On the other hand, no evidence is forthcoming of any toxin-production. If the amoebae were surrounded by a *toxic* necrosis, one would expect to find that the dead tissue could be demonstrated in the entoplasm of these parasites; on the other hand, digestion in these protozoa takes place in intracorpuscular vacuoles in which usually bacteria can be demonstrated.

Further evidence of the absence of toxins is seen in the absence of fever in uncomplicated amoebiasis, as well as in the absence of toxic manifestations in the patient, such as are usually seen in association with bacillary dysentery. In a personal infection Westphal induced in his own body, and in which the incubation period was 23 days [this *Bulletin*, 1938, Vol. 35, p. 586], he did not experience the slightest toxic disturbance, and even after the onset of *amoebic dysentery*, the sense of well-being was maintained.

Absence of toxins has also been established by intravenous injections of amoebic-culture extracts in rabbits [MENENDEZ, this *Bulletin*, 1933, Vol. 30, p. 26; HEATHMAN, *Ibid.*, p. 25]. Even in extracts used by

CRAIG [this *Bulletin*, 1928, Vol. 25, p. 228] for complement-deviation, no toxins can be demonstrated, but proteolytic ferments were present. Even the production of a positive complement-fixation does not necessarily indicate the active presence of a toxin.

Moreover, necrosis under aseptic conditions can be brought about by the liberation of proteolytic ferments from the leucocytes.

Westphal is of the opinion that in man *E. histolytica* exists normally as a harmless amoeba (*minuta* form) in the lumen of the gut and in this stage forms cysts. The *minuta* form is nourished by osmosis and phagocytosis and the nutriment is digested in the entoplasmic vacuoles. At this stage the amoeba can excrete a proteolytic ferment and become a pathogen. The extent to which the invasion of the bowel wall takes place depends upon the tissue-resistance of the host.

The breakdown of the resistance may be in the first instance due to bacterial spoiling which causes damage to the cells and functional disturbance of the bowels. After the formation of amoebic lesions a secondary alteration of the intestinal flora takes place and this is especially liable to ensue in tropical and sub-tropical climates. It is stipulated that a change in the life cycle of the amoeba then takes place so that it is no longer able to form cysts. The following effects are noted in man :—

(1) An acute bacterial disease in which the amoeba plays a small part and death occurs within a few days.

(2) Pure amoebic dysentery in which bacteria play a transient part.

(3) Chronic amoebic dysentery which is chemotherapeutically more difficult to cure.

As regards therapy, it is thought that the rectal or oral administration of Yatren and allied compounds can penetrate to a limited extent into the bowel wall, but on deep seated abscesses or metastatic lesions it has no action at all. On the other hand the parenteral injections of emetine are diffused throughout the body and these penetrate the deeply hidden amoebae, but do not touch the *minuta* forms in the bowel lumen. Rectal injections do not reach the more highly situated amoebic lesions and often result in establishing the " carrier-state."

So many factors are concerned in the production of " amoebic dysentery " that they must all concur at the same moment before " an epidemic " of amoebic dysentery can result and that is why it is so rare.

The sequelae of amoebic dysentery are not due to the activities of the organisms, but to the scarring of the bowel-wall and the dysfunctions which result from their former presence. In tropical regions, where intestinal upsets commonly occur, conditions are produced which favour the reproduction of *E. histolytica* and thereby virulent strains of the organism ensue, whilst in temperate climates, where these extraneous factors are absent, amoebic dysentery becomes a relatively mild disease. *P. H. Manson-Bahr.*

BENZONI (G.). Il problema dei portatori in amebiasi : la sede nell' intestino e la virulenza dell' *Entamoeba histolytica*. [**Carrier Problem in Amoebiasis : Situation in the Intestine and Virulence of** *E. histolytica*.]—*Pathologica*. 1938. Feb. 15. Vol. 30. No. 556. pp. 47–52. [29 refs.] English summary (10 lines).

The paper is a general discussion of views on the pathogenicity of *Entamoeba histolytica*. It is argued that that of REICHENOW, which

supposes that *E. histolytica* is normally a small harmless amoeba of the intestine, reproducing in the lumen and producing cysts, is the correct one. Under certain conditions penetration of the intestinal wall takes place, resulting in the large, tissue-invading amoebae and symptoms of amoebic dysentery. *C. M. W.*

SWARTZWELDER (John Clyde). **Studies on the Infection of Dogs with Trophozoites of *Endamoeba histolytica* by the Oral Route. A Preliminary Report.**—*Public Health Rep.* 1937. Oct. 15. Vol. 52. No. 42. pp. 1447–1451. [12 refs.]

The experiments described in this paper were designed to test the possibility of producing *E. histolytica* infections by the oral administration of trophozoites. In the first place it was determined, by sacrificing dogs 15 minutes to one and a half hours after the oral administration of 5 to 10 cc. of material aspirated from the large intestine of an infected dog, that trophozoites were able to survive in the stomach and to pass alive into the small intestine. Of 13 dogs which were given orally 3 to 7 cc. of material containing only trophozoites of *E. histolytica* five became infected, with incubation periods of 3 to 24 days. As regards the presence of free acid in the stomach it was found that viable trophozoites could occur after exposure for one hour to amounts of free HCl requiring from 12 to 40 cc. of N/10 NaOH to neutralize 100 cc. of gastric juice. It is evident that in the dog oral ingestion of unencysted amoebae may be followed by amoebic dysentery. *C. M. W.*

DESCHIENS (R.). Nouvelles données sur le rôle de la flore associée à l'amibe dysentérique dans l'amibiase expérimentale. [**The Influence of the Flora associated with the Dysentery Amoeba in Experimental Amoebiasis.**]—*C. R. Soc. Biol.* 1938. Vol. 127. No. 12. pp. 1076–1079.

Continuing experiments on the lines of others which he has previously carried out, the author shows here that the virulence to cats of a culture of *E. histolytica* is increased to the extent of producing infections in 45 per cent. in place of 20 per cent. of animals inoculated by the addition to the culture of a pathogenic strain of *Bact. coli*. The strain of *Bact. coli* inoculated to cats alone produced in 70 per cent. of the animals a simple enteritis which appears to be a predisposing factor in the establishment of an amoebic infection. It is noted that the amoebic infection in young cats is represented by an inflammatory and necrotic process over the greater part of the surface of the mucosa of the large intestine. It is only rarely that the deep circumscribed ulcers so characteristic of amoebic dysentery in man are observed. *C. M. W.*

DESCHIENS (R.). Le rôle de la flore bactérienne associée à l'amibe dysentérique, dans l'amibiase. [**Rôle of the Bacterial Flora in Amoebic Dysentery.**]—*Ann. Inst. Pasteur.* 1938. July. Vol. 61. No. 1. pp. 5–32. With 10 figs. (4 on 2 plates). [13 refs.]

In this article the author discusses the relationship of certain groups of bacteria to *Entamoeba histolytica* in the production of amoebic dysentery, a subject upon which he has made many experiments and

upon which he has written a number of papers [this *Bulletin*, 1935, Vol. 32, p. 778; 1937, Vol. 34, p. 325; 1938, Vol. 35, p. 580.] In the first place clinical and epidemiological observations have suggested to various workers that bacteria play some part in enabling the dysentery amoeba to produce actual dysentery. Thus, in countries or districts where the incidence of amoebic dysentery is greatest in the hot season it is then that the bacterial flora pollute drinking water most intensely. When in one country amoebic dysentery is especially prevalent in certain districts it is found that here faecal contamination of soil and water is occurring regularly. Similarly, outbreaks of amoebic dysentery occurred during the great war in France and Belgium amongst groups of people who were subject to the rigours of war when, in spite of the strictest measures, contamination of soil and water by faecal bacteria could not be avoided. Residents in the colonies who have suffered repeatedly from amoebic dysentery, on return to their homeland tend to become mere amoebic carriers without dysenteric symptoms, just as symptomless amoebic carriers occur commonly amongst persons who reside permanently in the home countries. From these various observations it can be deduced that the dysentery amoeba alone is a somewhat inoffensive organism which, however, can be so biologically changed by alterations in the bacterial content of the intestine that it assumes pathogenic properties and produces amoebic dysentery.

In support of this point of view the author reviews a long series of experiments he has already described in earlier papers. The object of these has been to gauge the pathogenicity of certain culture strains of amoebae by observing the percentage of 20 cats acquiring amoebic dysentery when inoculated directly into the ileum exposed by laparotomy. Having established this percentage, which in the case of some strains was low, the bacterial content of the culture was altered by transferring to it the bacteria from more virulent strains. It was possible then to determine that the percentage of animals contracting dysentery had considerably increased. By a long series of experiments carried out by the standard technique, which was first introduced by Frye and Meleney in 1933 [this *Bulletin*, 1934, Vol. 31, p. 284] and which the author describes in detail in this paper, it was possible to demonstrate that certain bacteria or groups of bacteria enable *Entamoeba histolytica* to give rise to amoebic dysentery. The study of the pathological anatomy of the intestine in amoebic dysentery reveals in the destructive process a bacterial element in addition to an amoebic one without, however, enabling one to decide which of these is to be regarded as the primary cause. It seems safe to conclude, however, that the intestine can be prepared for amoebic invasion by bacteria.

The paper is a long and carefully reasoned one and exposes fully what may be regarded as the modern view of the etiology of amoebic dysentery. *C. M. W.*

Deschiens (R.). Le rôle des bactéries dans l'amibiase intestinale. [**Rôle of Bacteria in Intestinal Amoebiasis.**]—Reprinted from *Paris Méd.* 1938. June 4. 8 pp.

This is a general account of experiments carried out by the author to demonstrate that just as dysentery amoebae require bacteria to enable them to develop and multiply in the culture tube, so do they depend

on certain pathogenic bacteria to enable them, when in the intestine, to penetrate the intestinal wall and produce the conditions which are grouped under the term amoebiasis. The various papers describing these results have already been reviewed in earlier numbers of the *Bulletin.* *C. M. W.*

DESCHIENS (R.) & DECOURT (Ph.). Action favorisante d'une colite toxique sur l'adaptation pathogène de l'amibe dysentérique. [**Pathogenicity of Dysentery Amoeba favoured by a Toxic Colitis.**]—*C. R. Soc. Biol.* 1938. Vol. 128. No. 23. pp. 1016–1019.

One of the authors has shown by previous experiments that the establishment of a colitis in kittens by the administration of certain bacilli, living or killed, favours the development of amoebic infection when cultures of *E. histolytica* are injected directly into the small intestine after laparotomy according to the authors' technique. In the present paper experiments are described which indicate that a colitis caused by an irritant such as croton oil likewise favours the establishment of the dysentery amoeba in the cat's intestine.

C. M. W.

GAUDUCHEAU (A.). Sur la pathogénie de l'amibiase. [**Pathogenesis of Amoebiasis.**]—*Bull. Soc. Path. Exot.* 1937. Oct. 13. Vol. 30. No. 8. pp. 656–658.

The author mentions his experience with a dog and a monkey which were experimentally inoculated with a bacillus and a virus. In both cases the injection transformed a latent amoebic infection into an active amoebic dysentery. A culturable free-living amoeba has been shown to grow actively only in the presence of certain bacteria, while its power of phagocyting staphylococci depends upon the simultaneous presence of *Bact. coli.* It is obvious that both pathogenic and free-living amoebae depend upon certain bacteria for their satisfactory development. *C. M. W.*

SARKISSJAN (M. A.). [**Pathogenicity to Kittens of Various Strains of *Entamoeba histolytica* from Healthy Human Carriers.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1938. Vol. 7. No. 1. [In Russian pp. 123–128. French summary p. 128.]

Experiments were conducted with the view of verifying the existence of avirulent strains of *Entamoeba histolytica,* such as "*E. dispar.*" Four strains of amoebae were isolated from different persons whose present and past history showed no symptoms of any intestinal disorder. Kittens were inoculated *per os* (4) with washed cysts from the faeces and *per rectum* (22) with cultures. Out of 26 kittens, infection resulted in 6 (2, 1, 1, 2 with the respective strains). The infected kittens all showed the typical symptoms of dysentery, and passed amoebae with ingested red cells, while the histopathological picture was similar to that found in kittens infected from human dysentery cases. It is concluded that the amoebae from symptomless carriers are identical with the pathogenic *E. histolytica* from which they are morphologically indistinguishable. *C. A. Hoare.*

FRYE (William W.) & MELENEY (Henry E.). **The Pathogenicity of a Strain of Small Race** *Endamoeba histolytica.—Amer. Jl. Hyg.* 1938. May. Vol. 27. No. 3. pp. 580–589. With 5 figs. on 1 plate. [14 refs.]

The paper discusses the strains of *E. histolytica* which produce cysts under 10μ in diameter. The observations recorded were based on stool examinations carried out in the Department of Preventive Medicine and Public Health of the Vanderbilt University School of Medicine during the years 1930–1937. The specimens examined, 9,449 in number, gave 325, or 3·44 per cent., positive for *E. histolytica.* Of these, 85·2 per cent. were the large race with cysts over 10μ in diameter, 13·5 per cent. were the small race and 1·2 per cent. were mixed large and small races. It is noteworthy that before the beginning of 1935 only seven instances of infection with a small race were detected, whereas since then there have been found 37 cases. It was not possible to account for this increased incidence, which was a real one. One of the small races was successfully cultivated. During maintenance by subculture the amoebae remained constantly small in size and showed no tendency to ingest red blood corpuscles when these were added to the medium. The few cysts which were produced in cultures were constantly small in size. Culture was injected into the terminal ileum after laparotomy in 22 kittens, only five of which became infected. The amoebae which were small in size showed less tendency to invade the tissues than did large races, such lesions as were produced being very superficial in character. Complement fixation tests carried out with a large race antigen on 14 carriers of small race amoebae gave a positive result in five. The patient from whom the small race was cultivated gave a positive complement fixation reaction which became negative after treatment. It is concluded that a small race of *E. histolytica* exists which is relatively fixed in its size and activity and that it possesses a low power of invasion of the tissues of man and experimental animals. *C. M. W.*

WILKINSON (W.). **An Investigation into the Value of Sigmoidoscopic Examination as an Aid to Diagnosis of Chronic Amoebic Infection in Man.**—*East African Med. Jl.* 1938. Dec. Vol. 15. No. 9. pp. 295–299.

The author has analysed a hundred patients with abdominal complaints of considerable duration, examined by sigmoidoscope either by himself or by Dr. BRAIMBRIDGE during the past year. He divides his cases into two groups, according as there were clinical signs of amoebiasis or not. Of the former there were sixty. Twenty were found to have a normal mucosa, 17 an extensive hyperaemia, 3 had haemorrhagic areas, 12 had ulceration, and 8 leucoplakia. Details of the findings in each of these subgroups are given. *E. histolytica* was found in 17 of the 60 and the author concludes that no case of amoebiasis was discovered by sigmoidoscope which had not been diagnosed clinically or by examination of the stools, and that consequently in chronic cases sigmoidoscopy is of value as confirmatory in a small proportion only. *H. H. S.*

BONSIGNORE (A.). La cutireazione all'istidina nella colite amebica. [**Cutaneous Histidine Reaction in Amoebic Colitis.**]—*Riv. Sanitaria Siciliana.* 1938. Nov. 15. Vol. 26. No. 22. pp. 1279–80, 1283–4, 1287–8, 1291–2, 1295.

For this test the author employs 0·1 cc. of a 10 per cent. solution of histidine. The immediate result is local pallor of 0·75 cm. diameter. In positive cases after 1–2 minutes a reddening appears over the area of a 20-lire piece and lasts for 40–45 minutes and often shows dendritic prolongation at the periphery; there is a feeling of heat but not of pain. If the reddening is not observable in 5–6 minutes, the reaction is regarded as negative.

The author had studied the reactions in 72 cases and finds that in chronic amoebic colitis the skin reacts to amino-acids with greater intensity than in cases of gastro-enteritis, or non-amoebic infections; treatment of the condition reduces very greatly this reaction, and it is inferred that in chronic amoebiasis of the intestine there is a distinct affection of general and local protein metabolism. *H. H. S.*

PAULSON (Moses) & ANDREWS (Justin). **Complement Fixation in Amebiasis. A Comparative Evaluation in Clinical Practice.**—*Arch. Intern. Med.* 1938. Apr. Vol. 61. No. 4. pp. 562–578. [13 refs.]

The authors have attempted to estimate the true value of the complement fixation test as a diagnostic procedure for amoebiasis. Sera from 150 cases which had been studied clinically and parasitologically were submitted to one or more laboratories where the amoeba complement fixation test was being carried out with one or more antigens. When the results were tabulated it was found that the positive results occurred more frequently amongst those cases in which amoebic infection had been determined microscopically than in others, but the numerous falsely positive results show that the test is unreliable in the individual case. It is pointed out that the test as carried out at present is merely a diagnostic aid and that in spite of the many disadvantages of microscopic faecal diagnosis this method is still more reliable than complement fixation. CRAIG, who has done so much to develop the complement fixation test for amoebiasis, has admitted that when adequate faecal examinations can be carried out the test is unnecessary. *C. M. W.*

CRAIG (Charles F.) & SWARTZWELDER (John Clyde). **Observations upon the Complement-Fixation Test in Monkeys infected with** *Endamoeba histolytica.*—*Proc. Soc. Experim. Biol. & Med.* 1938. Jan. Vol. 37. No. 4. pp. 671–673.

MELENEY and FRYE [this Bulletin, 1938, Vol. 35, p. 583] have reported that monkeys (*Macacus rhesus*) naturally or experimentally infected with *Entamoeba histolytica* did not give complement fixation reactions, with one exception, and showed no macroscopic or microscopic lesions at autopsy. The authors of the present paper noted that a monkey infected with a human strain of *E. histolytica* consistently gave a four-plus complement fixation reaction for amoebiasis. To investigate the matter further a strain of *E. histolytica* occurring naturally in a monkey was used to infect three other monkeys. This monkey

strain was identical morphologically with strains occurring in men, while cysts fed to a dog produced infection associated with typical lesions in the caecum and colon. The three monkeys, which were infected by feeding them with cysts, all gave a positive complement fixation reaction. All the four monkeys were examined post-mortem and lesions in the caecum and colon were found in three. The one exception was an animal in which the complement fixation reaction had become doubtful 27 days before death. In view of the previous positive reaction it seems probable that this monkey was recovering spontaneously. *C. M. W.*

MANSON-BAHR (Philip). **Amoebic Invasion of the Skin and Subcutaneous Tissues.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1938. Aug. 25. Vol. 32. No. 2. pp. 223–227. With 5 figs. on 1 plate. [28 refs.]

The case described is that of an ex-soldier from India, aged 25 years, on whom colostomy was performed owing to the sigmoidoscopic appearance of the rectum suggesting carcinoma. Extensive ulceration of the abdominal wall around the colostomy opening followed. Ultimately *Entamoeba histolytica* and trichomonas were found in the discharge from the ulcerated area. Amoebae were also found in portions of the tissue removed from the ulcer while amoebic ulceration of the rectum was observed by sigmoidoscopy. Response to emetine treatment was immediate, though final recovery was delayed by complications such as perforated appendix, pelvic abscess and pneumonia. Finally after a course of auremetine and yatren, which rid the patient of his persisting amoebic infection, the colostomy wound was successfully closed. *C. M. W.*

PIERI, SARDOU & BOUDOURESQUE. Maladie kystique du poumon chez un amibien. [**Cystic Disease of the Lung in a Case of Amoebiasis.**] —*Bull. Soc. Path. Exot.* 1937. Oct. 13. Vol. 30. No. 8. pp. 659–664.

A patient who had on two occasions suffered from amoebic abscess of the liver was again admitted to hospital for an obscure condition of the lung which was ultimately diagnosed as pulmonary cyst rupturing into the pleural cavity. On no occasion was it possible to demonstrate amoebae in the material coughed up or aspirated from the pleural cavity, nor did any response to emetine treatment occur. The clinical aspects of the case are discussed in some detail. *C. M. W.*

WU (S. D.). **Amoebic Infection of a Nasopharyngeal Polyp.**—*Chinese Med. Jl.* 1938. Mar. Supp. No. 2. pp. 217–220. With 2 figs. on 1 plate. [19 refs.]

The specimen examined was from a tumour, " the size of an orange," removed from the back of the nose of a Chinese, aged 28 years. Its structure was that of a muco-fibrous polyp, with localized areas of ulceration and in the necrotic patches with granulation tissue were fusiform bacilli and amoebae. Unfortunately, all material available for examination had been sent in formalin, so there was no opportunity to examine living amoebae from fresh material. No history could be obtained of amoebiasis, the patient's stools were free of amoebae or their cysts. Since fusiform bacilli were present also the ulceration

cannot be attributed solely to the protozoon. The question arises as to whether the amoeba was *histolytica* or *gingivalis*. Bacteria were found within them in this case—a point more in favour of *gingivalis*, but red corpuscles were also found—a point in favour of *histolytica* and strongly against *gingivalis*. They measured from 8–17 microns in diameter. Since only preserved material was available, no final decision could be made. *H. H. S.*

LOUBEYRE (J.), TILLIER (H.) & FOISSIN (J.). Polynévrite des membres inférieurs apparue au décours d'une paratyphoide B et d'une amibiase intestinale, et guérie par un traitement émétinien. [**Neuritis in Association with Paratyphoid Fever and Intestinal Amoebiasis cured by Emetine.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1938. Dec. 12. 54th Year. 3rd Ser. No. 33. pp. 1702–1706.

A commercial traveller, 32 years of age, suffered from an attack of paratyphoid B and neuritis of the legs, and some months later had a haemoptysis. There was no sphincter involvement. No cause was discovered for this haemoptysis, but on a subsequent occasion a diagnosis of "pulmonary, hepatic and intestinal amoebiasis" was made; when diarrhoea, 8–10 stools a day, led to faecal examination and discovery of *E. histolytica*. Electrical treatment had failed to benefit the paralysis, but on the exhibition of emetine for the amoebiasis the paralytic symptoms also cleared up. The authors note that GRALL, DIOT (in Morocco) and ROGER (of Marseilles) have noted that polyneuritis does occur as a complication—though a rare one—of amoebiasis. *H. H. S.*

ENDERLE (Carlo). Sindromi neuropsichiche nella amebiasi cronica. [**Nervous and Mental Syndromes in Chronic Amoebiasis.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1938. Sept. & Oct. Vol. 19. Nos. 9 & 10. pp. 513–558; 577–586. [73 refs.]

SAUTET (Jacques). A propos des abcès amibiens du foie. [**Amoebic Abscess of the Liver.**]—*Rev. Prat. Malad. des Pays Chauds.* 1938. July. 17th Year. Vol. 18. No. 7. pp. 323–4, 327.

The author stresses the fact that obscure hepatic conditions in the tropics and subtropics are probably more often due to *E. histolytica* than is generally believed. The fact of the pus from a liver abscess being sterile, or, in an earlier stage, a hepatitis of obscure origin should lead to a very careful and, if necessary, repeated examination of the faeces. It is not, he thinks, sufficiently appreciated that cysts may be found and hepatitis and even abscess occur without there being a history indicative of a previous attack of true dysentery. *H. H. S.*

HUARD (P.), LONG (M.) & GRAZIANI. Réflexions sur une nouvelle série de 48 abcès du foie. [**Reflections on a Further Series of 48 Liver Abscesses.**]—*Rev. Méd. Française d'Extrême-Orient.* 1938. Mar. Vol. 16. No. 3. pp. 170–217. [Refs. in footnotes.]

This is a valuable paper emphasizing that in Indo-China a large proportion of abscesses of the liver show primary or secondary bacterial infection, necessitating more frequent resort to open operation and drainage.

The authors now add records of 48 new cases to the 150 previously recorded by them. They quote figures of 99 cases in eight years in Tonking, as well as data from other countries. They also quote evidence that some cases are caused by bacterial infection, and not by amoebae, and the former appear to be more frequent in Indo-China than in India and elsewhere. Such bacterial, and especially streptococcal and staphylococcal infections, may be secondary to amoebic abscesses. They also note that such organisms may be found by haemoculture. A table of the data of seven series of cases by other workers in the Far East shows 90 amoebic and 7 non-amoebic cases, but the author's own figures showed among 42 Tonking cases only 3 amoebic and 39 non-amoebic cases. Such a remarkable difference has naturally led them to adopt different treatment from that found most effective in other countries. They quote the old French contention that the amoebae carry to the liver the bacteria that cause the abscess, although the reviewer has never seen any explanation of why such septic organisms die out of the liver alone and leave so many amoeba-containing abscesses sterile as regards bacteria. They also refer to other very rare causes of liver abscess such as worms, distoma, gallstones and hydatids.

The symptoms are next discussed, and the frequency of different signs recorded in accordance with general experience. The rarity of definite jaundice is emphasized, except that due to pressure of a large abscess on the hepatic ducts as in the case quoted from ROGERS. More important are the complications met with, which are discussed at length. Intraperitoneal perforation may be sponteneous or follow on puncture or drainage operations, and the authors quote published records of cure obtained in sterile cases by simple aspiration of the abdominal pus combined with emetine treatment, which they will be tempted to try in future. Recent data collected by SANTANELLI showed in localized peritoneal infections 13 cures and 9 deaths, and in generalized ones 5 cures and 18 deaths. In a table of 690 liver abscess cases they record 88 with rupture into the peritoneal cavity. Multiple and recurring abscesses are next dealt with and their serious import noted.

Under diagnosis they record further successful use of the method of injecting lipiodol, collargol or tenebryl into the abscess cavities, to detect their extent and complications through spread to neighbouring organs, such as the lung or some part of the gastro-intestinal canal.

The results of treatment in a number of eastern countries are summarized in Table 7. They show great variations in the mortalities, but only two deal with a considerable number of cases. The very high death rate of 80 to 90 per cent. in the non-amoebic cases of Yoshitake is noteworthy. The Indian Army with only 12 per cent. mortality among 83 cases, doubtless largely in amoebic cases, presents a great contrast. In an analysis of their own cases the authors point out that nearly all their fatalities occurred in cases showing bacterial infection, and very few in purely amoebic cases. This is in accordance with Indian experience. Owing, however, to the much larger proportion of bacterial infections in their series they naturally adopted the open operation as a rule. In cases suitable for emetine treatment they prefer to give the drug intravenously. They find adrenalin of value as a safeguard to the heart against the depressing effects of the former drug.

Table showing the Mortality from Liver Abscess in Various Statistics of Indo-China and the Far East.

Sources	Number of abscesses observed	Number of Deaths
Military statistics from the Dutch Indies (1934–1936)	17	3 (17 per cent.)
Military statistics from the Dutch Indies (1920–1925)	268	76 (28·7 per cent.)
Military statistics from British India (1930–1935)	83	10 (12 per cent.)
Military statistics from British India (1935)	4	1 (25 per cent.)
Chang and Robertson (aspiration cases)	9	1 (11 per cent.)
Chang and Robertson (operation cases)	14	2 (14 per cent.)
Chang and Robertson (total) ...	34	4 (9 per cent.)
Yoshitake	Non-amoebic abscess	80 to 90 per cent.
	Amoebic abscess	20 per cent.
Massias (total)	19	3 (15·9 per cent.)
Massias (operation cases)	4	2 (50 per cent.)
Massias (aspiration cases)	5	1 (20 per cent.)

L. Rogers.

WIJERAMA (E. M.). **Tropical Abscess of the Liver.**—*Jl. Ceylon Branch Brit. Med. Assoc.* 1938. May. Vol. 35. No. 3. pp. 263–267.

During a period of 21 months, among 4,070 patients admitted to the author's wards were 48 with liver abscess, *i.e.*, about 12 per mille, Those in the fourth decade were twice as numerous as in any other corresponding period; only one was under 20 years, eight between 20 and 30 years and for the succeeding decades 19, 10 and 10, the oldest patient being 58 years. All, without exception, were males. A history of previous dysentery was obtained in thirty-four [but the interval between the dysentery and the onset of symptoms of liver abscess (or hepatitis) is not stated]. It is interesting to note the treatment adopted. Forty-three received injections of emetine only, adults 1 grain daily for twelve days with an interval of two days between the sixth and seventh injections. Four patients were aspirated as well as being given emetine, one being aspirated once, two twice and one three times. These forty-seven all did well. One patient was transferred to the surgical ward and died after operation. *H. H. S.*

PEIRIS (M. V. P.). **Tropical Abscess of Liver.**—*Jl. Ceylon Branch Brit. Med. Assoc.* 1938. Sept. Vol. 35. No. 5. pp. 381–384.

The author's remarks are based on a very small number of cases, 28, and he excludes the inflammatory condition preceding actual abscess. [It is a pity that with so small a total as 28, percentages are given throughout in place of actual figures; they are very apt to mislead.] Eighty per cent. [? 22 cases] were of obscure onset, with moderate fever up to 101°F. only, no sweats or rigors; a history of dysentery

or diarrhoea was obtained in less than half, 45 per cent. [? 13]. The author found that alcohol in moderate quantities was taken by 24 per cent. [? 6 or 7] and concludes that "it is likely that toddy was the medium of infection in these cases." He adduces, however, no other evidence for this generalization. Pain in the right upper abdomen was present in 60 per cent. [? 17 cases], tenderness over the liver in 95 per cent.; jaundice in 4 per cent. [presumably a single case]. Sweats were uncommon, loss of weight marked with large collections of pus; leucocytosis ranged from normal to 18,600 per cmm. with an average about 12,000; pus withdrawn usually sterile.

The author recommends the giving of emetine for three days before aspiration is undertaken. He warns against the use of the knife for incision of the liver over an abscess because of the risk of uncontrollable haemorrhage; also of a long needle for exploring because of the danger of puncturing the inferior vena cava.

The commonest complication of untreated abscess was rupture. Of twelve such cases under the author's observation four ruptured into the lung and pleura, two through the chest wall, two into the peritoneum and four through the abdominal wall. He states that abscesses rupturing into the peritoneum set up acute and extensive peritonitis, although ordinary pus-forming organisms were absent and proved invariably "fatal if operative treatment was undertaken early," and shock was profound. Nevertheless "at exploratory laparotomy two such cases were found to be ruptured tropical abscesses. Both patients recovered when the matter in the peritoneal cavity was mopped out and the abdomen was drained." [These statements are not easy to reconcile; is a "negative" omitted from the first?]

H. H. S.

BROWN (Philip W.) & HODGSON (Corrin H.). **Late Results in Treatment of Amebic Abscess and Hepatitis of the Liver.**—*Amer. Jl. Med. Sci.* 1938. Sept. Vol. 196. No. 3. pp. 305–313.

This is an important contribution from the Mayo Clinic to the incidence of amoebic hepatitis and liver abscess in the North Temperate Zone climate of the United States.

Invasion of the liver by amoebic infection from the large bowel is a serious affection as shown by the high mortality prior to the introduction of the emetine treatment. A review of 18 years' Mayo Clinic records shows 18 actual cases of liver abscess and 17 with clinical signs of hepatic involvement. The amoeba was found to be the cause in 18 (14 per cent.) of 125 liver abscess cases in this temperate zone area. Only 4 of the 35 cases were in women and these were all among the 17 non-surgical cases; none of the 18 surgical cases were females. Even a history of diarrhoea was absent in 8 of the 35. Pain in the lower right thorax was the most frequent symptom; it also occurred in the right shoulder in 8 and in the left in one. Fever was present in all but four. Leucocytosis is present, but may be minimal during a quiescent phase. Tenderness on pressure over the liver is common. X-rays may reveal liver enlargement and fixed right diaphragm. The stools were positive to amoebae in 26 cases, and in 8 more that organism was found in the liver abscess pus. Three cases were recognised by the characteristic response to emetine. In 7 of 17 proctoscopic

examinations ulcers were found in the large bowel. The bromsulphthalein ["bromsulphalein"] test indicated liver damage in 8 of 13 cases so examined.

The late results of treatment in 14 medicinal cases was unknown in two, and the remaining twelve remained "apparently well" two to six years later. In the cases giving clinical evidence of a serious condition antiamoebic treatment was followed by disappearance of the symptoms "as if by magic." Emetine injections were followed by stovarsol orally. The difficulties in the diagnosis of pus formation are stressed. In one case after drainage digestion of the sinus produced a hole in the epigastrium admitting a fist, but once amoebae were found the huge hole filled up in a few days under the specific treatment. Among the 18 patients operated upon for liver abscess there were two deaths, one admitted in a moribund condition and one in whom amoebae were only found in the pus some time after operation. In one there was evidence of a recurrence in 1925, six years after operation, whether a relapse or a reinfection is uncertain. He developed another abscess of the liver six years later in 1931. One died of other causes six years later, the remaining 14 were apparently well from two to 12 years later. The above data should be of use to medical men in Great Britain, who are liable to meet with amoebic hepatitis at any time, usually in patients who have resided in a warm climate, sometimes years previously. *L. Rogers.*

TRABAUD (J.) & RABÏE (Djimil). Numération globulaire et formule leucocytaire dans l'amibiase hépatique. [**Blood Conditions in Amoebic Hepatitis.**]—*Rev. Prat. Malad. des Pays Chauds.* 1938. Aug. 17th Year. Vol. 18. No. 8. pp. 367–8, 371–2.

The authors record the case of a man of 45 years admitted to hospital with fever and rectal haemorrhage. The fever had been of a malarial type for the previous month. There was no tenesmus or passage of mucus till four days after admission. He had, however, pain in the right hypochondrium but the area of liver dulness was not increased. He was pale and weak. Although no malaria parasites were seen quinine was given on account of the type of fever and in four days the temperature dropped almost to normal and the rectal haemorrhage ceased. Exhibition of emetine led to disappearance of the mucus and of the hepatic pain. In the course of a fortnight the red cells increased from 3½ to 4½ million per cmm., but the leucocytes showed a steady increase from 9,000 to 19,600, with 73 per cent. polymorphonuclears. The patient left hospital "cured" eight days later. In the discussion which followed presentation of this case doubt was expressed as to the "cure," on the grounds that the persistent and increasing leucocytosis might indicate a small residual liver abscess. *H. H. S.*

DAVIS (E. Cosman). **A Case of Amoebic Hepatitis.**—*Jl. Roy. Nav. Med. Serv.* 1938. Oct. Vol. 24. No. 4. pp. 344–349. With 2 figs. & 2 charts.

This is a very clear account of an interesting and, for some weeks, a puzzling condition. A man of 37 years gave a history of a "chill" a fortnight before admission to hospital and ten days later pain in the right side of the chest. This was increased on inspiration; there was slight nausea, temperature was subnormal, 96·8°F., pulse 112, resp.

40 per minute, some cyanosis but no cough. There were signs of consolidation over the lowest third of the right lung and the base of the left. Naturally, a diagnosis was made of lobar pneumonia of the right lung. The temperature then rose to 102·8°F., cough supervened and became increasingly troublesome with vague pains in the right lumbar region; the blood showed a leucocytosis of 15,000 or so. X-ray next showed a completely opaque right side of the thorax, and with the idea that this was due to fluid, tapping was decided upon, but without drawing any fluid. Sputum increased in quantity and became plum-coloured. Faecal examination revealed no parasites—protozoal or helminthic. Prontosil was given without benefit and emetine was tried, as a shot in the dark when the temperature chart suggested amoebic hepatitis, and the clinical picture underwent a rapid change—the pain disappeared, cough and sputum diminished, sleep returned and the patient gained weight. [The case is instructive as warning one to be on the look out for amoebiasis when anomalous "pneumonic" signs appear in the right lung, especially if in the early stages there are signs of consolidation without rigor or elevation of temperature.]

H. H. S.

MATTEI (Charles). Notes sur le traitement de l'amibiase par l'émétine. [**Emetine in the Treatment of Amoebiasis.**]—*Marseille-Méd.* 1938. July 5–15. Vol. 75. No. 19–20. pp. 51–62.

This paper summarizes the author's extensive experience in the treatment of amoebiasis by emetine. He has found that, of 48 centigrams given hypodermically in six days treatment, only 8 cgm. have been eliminated by the end of that time and that the drug is still being excreted in the urine up to 40 days thereafter. He has been impressed by the frequency of emetine poisoning as a result of the accumulative property of the drug. Of 66 cases of emetine poisoning reported in the literature, 16 died; 15 of these had received more than 1·0 gm. The premonitory signs of poisoning, for which a most careful daily examination is urged to avoid disaster, are:—(i) alimentary; persisting nausea, return of diarrhoea; (ii) urinary: oliguria, azotaemia, slight albuminuria; (iii) circulatory: grave hypotension, increased cardiac response to effort. The appearance of any one of this triad calls for immediate suspension of emetine. Established poisoning, which terminates fatally in 25 per cent. of the cases in which it appears, is manifested by sensory and motor indications of a polyneuritis of the lower or of all four limbs and grave cardiac insufficiency. These signs are always observed; less frequent are visual troubles, skin eruptions, spasmodic cough with copious mucous expectoration and increasing signs of renal failure. 80 cgm. is the maximum total dose to be taken in a month, followed by 6 weeks' suspension of emetine treatment. The author found that premonitory signs of poisoning appeared in 40 per cent. of cases who had not received nearly 80 cgm., 20 per cent. had not even reached 50 cgm. These observations have led the author to be very cautious in dosage. He recommends, for adults, either an intensive course of 8 cgm. daily for five days, followed, after four days' intermission, by 6 cgm. daily for four days or a modified course of 6 cgm. daily for five to seven days. Both courses to be followed by at least six weeks suspension of emetine treatment, meanwhile arsenicals should be administered. For children, the injections are given in two series

with a six day interval between them. Up to one year, 5 mgm. a day, up to a total of 5 cgm. ; from 1 to 2 years, 1 cgm. daily, total 10 cgm. ; from 3 to 5 years, 2 cgm. a day, total 20 cgm. ; from 6 to 9 years, 3 cgm. daily, total 30 cgm. ; from 10 to 13 years, 4 cgm. daily, total 40 cgm. For the last age group five weeks', for the others four weeks', suspension of emetine treatment is observed after the last dose. The doses mentioned refer to the hydrochloride of emetine ; for other compounds the dose is proportional to their emetine content. In the acute stage subcutaneous injection is advised ; in chronic cases the double iodide of bismuth and emetine or auremetine (28 per cent. of emetine) are given in capsules. Of the latter, he gives four capsules of 1 grain each daily up to a total of 60 grains. Congestive amoebic hepatitis yields rapidly to emetine and he is convinced that typical hepatic abscess may undergo resorption under this treatment.

That failures with emetine treatment occur he allows. Apart from cases treated with insufficient doses, mixed infections of bacterial and amoebic dysentery and cases complicated by a *Lamblia* or other protozoal infection, he finds that 5 per cent. of acute cases resist emetine. In such cases arsenicals must be employed. Insufficient dosage with emetine—less than 6 cgm. a day in the adult—produces emetine-resistant amoebae. The author finds that anaphylactic symptoms are not infrequent in attendants and pharmascists but rare in patients. They are vesiculo-erythematous rashes of face and hands. In the sick, extensive erythema, oedema and arthralgia have occurred in patients previously treated with ipecacuanha. As to whether it is permissible to speak of "cure," the author is very reserved. A useful paper, deserving of careful study by those practising in the tropics.

J. B. Davey.

HAKANSSON (E. G.). **On the Effectiveness of Carbarsone as a Remedy for Amoebiasis.**—*Amer. Jl. Trop. Med.* 1938. May. Vol. 18. No. 3. pp. 245–269. [24 refs.]

A careful analysis of the results obtained in 43 cases of amoebiasis by treatment with Carbarsone given in capsules by mouth.

The cases are separated into four groups in which varying dosage was employed :—(i) 12 gm. in four weeks ; (ii) 18 gm. in five weeks ; (iii) 11·25 to 16 gm. in ten days ; (iv) 5 to 10 gm. in ten days. In the last two groups, dosage was proportional to body weight. In all cases, divided doses, two or three times daily, were given after meals.

The cases comprising groups (i) to (iii) were asylum inmates ; those in group (iv) laboratory technicians and their families. Among the former were six of acute dysentery, the rest were all carriers.

The patients were on ordinary diet and no other drugs were employed ; except for a few of the acute cases, in which exhaustion compelled rest in bed, the patients were up and about.

During the twelve months following treatment, at least 31 thorough microscopical examinations of the faeces of each case were made. The sugar flotation method of YORKE and ADAMS was employed when examining stools of normal appearance. The test of cure was, therefore, a stringent one.

In one instance only were toxic symptoms seen. This was a woman weighing only 86 lbs., who developed jaundice and glycosuria after a course of 10 gm. in 23 days. The toxic symptoms cleared up in a fortnight.

There was no vomiting; colicky pain in the epigastrium was complained of by one patient.

The faeces were negative throughout the year of observation in 19 of the 43 cases following treatment and in one of seven submitted to a second course of treatment after relapse. The intensive 10 day courses gave the best results. All the cases in group (iv)—laboratory technicians and their families—passed the test, although a low dosage was employed in this group.

As Hakansson points out, it is probable that some of the failures in the asylum cases were actually reinfections, for no precautions against this were possible and an earlier survey by C. M. JOHNSON revealed that there was an *E. histolytica* incidence among the inmates of this asylum of 35 per cent.

The immediate result in carriers was the disappearance of cysts from the stools in three days. In the acute cases, the stools were free of *E. histolytica* and of blood and mucus in two to four days.

Hakansson is rightly cautious in drawing wide conclusions from this small, but exhaustively investigated, series of cases and concludes his paper with useful suggestions on the precautions to be observed in prescribing this valuable drug. *J. B. Davey.*

GRASSO (Rosario). Sul valore terapeutico dell'acido p. carbamido fenilarsonico (Fenarsone) nella colite amebica. [**Fenarsone in Amoebic Colitis.**]—*Riv. Sanitaria Siciliana.* 1938. Aug. 15. Vol. 26. No. 16. pp. 921–930. [10 refs.]

Fenarsone is the Italian equivalent of Carbarsone. The author has employed it in treating forty patients, giving 50 cgm. daily for ten days. He found that the entamoeba, both vegetative and cystic forms, disappeared early, it might be in two days, but usually within a week. Twelve of the patients examined at intervals up to eight weeks afterwards were still found negative, and the drug was well tolerated by all.

In discussing the dosage the author states that American physicians prescribe for an adult 75 mgm. per kilo. body weight, over a period of three weeks; the minimum and maximum doses found effectual being 29 and 204 mgm. per kilo. without giving rise to toxic symptoms. The general dosage recommended is 75 mgm. per kilo. over a period of at least ten days and given in two doses a day. It has proved efficacious, but not so completely, in infections by *E. coli*, *E. nana*, *Iodamoeba butschlii*, Chilomastix, and Giardia. [See also this *Bulletin*, 1934, Vol. 31, p. 282; 1936, Vol. 33, p. 543.] *H. H. S.*

PYMAN (F. L.). **Chemotherapy of Amoebicides.**—*Nature.* 1937. Nov. 13. Vol. 140. No. 3550. pp. 832–834. [10 refs.]

In this paper the author reviews work that he has carried out on derivatives of harmol with a view to the discovery of amoebicidal drugs. The various derivatives were tested on cultures of *E. histolytica*. A series of compounds of the general formula RR'N. $(CH_2)_x$. NRR' was prepared and it was found that of these the most active were $\alpha\kappa$-tetra-*n*-amyldiaminodecane (R,R'=*n*-amyl : $x=10$) and $\alpha\lambda$-tetra-*n*-butyldiaminodecane (R,R'=*n*-butyl : $x=10$). The first of these in

acid medium is five times more potent than emetine, whereas in alkaline medium it is less so. Furthermore it was less toxic to mice both orally and subcutaneously. Clinical trials proved it to be less effective than emetine for the treatment of amoebic infections. It was too irritating to be administered in any other way than orally. Tested on cultures in alkaline medium it was found to be less effective than emetine and it would appear that the results of tests in faintly alkaline media are better indications of possible clinical value.

C. M. Wenyon.

HILLEMAND (P.) & GAUBE (R.). Le traitement de la dysenterie amibienne. [**The Treatment of Amoebic Dysentery.**]—*Rev. Prat. Malad. des Pays Chauds.* 1938. July. 17th Year. Vol. 18. No. 7. pp. 301–4, 307–8, 311–12, 315–16, 319–20.

A general review of the subject dealing with it on orthodox lines but containing no fresh information. *H. H. S.*

BONNIN (H.) & ARETAS (R.). *Entamoeba dysenteriae* et émétine in vitro. Essais d'émétine. Résistance provoquée. [**Emetine Resistance of** *E. histolytica in vitro.*]—*Bull. Soc. Path. Exot.* 1938. Nov. 9. Vol. 31. No. 9. pp. 829–833.

The authors have tested the action of emetine on *E. histolytica* by adding the drug in various concentrations to culture media in which the amoeba was being cultivated. It was found that strains of the amoeba differed from one another as regards the concentration of emetine which could be tolerated. Furthermore it was found that by growing amoebae in emetine-containing media the resistance of the amoebae to the drug could be increased. This exposure to emetine brought about certain morphological changes in the amoebae, but these were rectified when the amoebae were again grown in emetine-free media. Even after ten sub-cultures in emetine-free medium some of the acquired resistance is still maintained. *C. M. W.*

VALETTE (Guillaume) & ROLLÉ (René). Etude de l'action de la quinine sur les amibes : pénétration cellulaire et toxicité. [**Action of Quinine on Amoebae : Cell Penetration and Toxicity.**]—*C. R. Acad. Sci.* 1938. Nov. 28. Vol. 207. No. 22. pp. 1071–1073.

By the use of the microscope with ultraviolet illumination it is possible to observe the entry of quinine into living cells and its distribution there on account of the fluorescence produced by the drug. Having studied the effect of quinine on paramoecium the authors have turned their attention to amoebae. Cultures of *Amoeba dubia* were employed. When washed and placed in solutions of quinine of suitable strength it was found that the drug entered the amoebae and fixed itself to certain inclusions or vacuoles. From the degree of fluorescence it would appear that the quinine was present in these amoebae in a greater concentration than it was in the solution outside the amoebae. After a while the intensity of fluorescence diminished, till finally, with the death of the amoebae, there was a uniform weak fluorescence over the whole cytoplasm. *C. M. W.*

DESCHIENS (R.) & PROVOST (A.). Exposé d'une technique d'inoculation de l'amibe dysentérique au chat, par laparotomie. [**Technique of Inoculation of Dysentery Amoebae into the Cat by Laparotomy.**]—*Bull. Soc. Path. Exot.* 1937. Oct. 13. Vol. 30. No. 8. pp. 648–655. With 6 figs. on 3 plates.

The authors give a detailed description, illustrated by photographs, of the operation of exposing under ether anaesthesia the ileocaecal valve of the cat for the purpose of inoculating directly into the ileum, near the valve, material containing *E. histolytica*. The mortality from this laparotomy is very low while, according to the strain of amoeba used, infections are produced in from 3·45 to 83·33 per cent. of the cats. The large intestines of the infected animals show degrees of involvement varying from a simple mucous colitis or erythema of the mucosa to extensive and deep ulcerations of the wall of the intestine. [See also MELENEY and FRYE, this *Bulletin*, 1933, Vol. 30, p. 387.] *C. M. W.*

PLAGUE.

Précis of Abstracts in this Section.

Raghavender Rao (p. 307) remarks on the meagreness of historical information on plague in Calcutta.

Vine (p. 307) shows that infection travelled with bags of grain from store to store during an epidemic in the Nilgiris. Uttley (p. 307) mentions the meteorological conditions which favour the spread, and those which tend to cause the disappearance, of plague in Hong Kong. They are, however, not the only factors concerned in the appearance of the disease.

Buxton (p. 308) studied the biology of *X. cheopis* under controlled climatic conditions on a mouse in a "synthetic mouse-hole." The findings cannot be further abstracted. Ramos Díaz (p. 310) considers that *Pulex irritans* has adapted itself to the cui (a species of guineapig) in Peru, and has transmitted plague to man from this rodent. Contact between cuis and rats probably accounts for the epizootics in the former.

Girard (p. 310) uses subcutaneous injection of material to be tested, in salt solution, for rapid results in diagnosis.

Eskey (p. 310) shows that only "blocked" fleas are infective. These usually die within 48 hours. Probably any species may be a potential vector but wild rodent fleas only desire human blood when starved. Lists of rats and fleas found are given by Mayfield (p. 311) for Plymouth, London and Liverpool, Pistoni (p. 311) for Abyssinia, Otomo *et al.* (p. 312) for the Customs' depot at Kobé and Guimarães (p. 312) for Santos in Brazil.

Ristorcelli (p. 312) names the rodents found in Nefzaoua, of which gerbils and *Psammomys* are the most common.

Morgan (p. 313) details the method advised by the Ministry of Health for the examination of rats for plague.

Robic and Minec (p. 313) describe a patient in whom intramuscular abscesses containing *Past. pestis* developed during a fatal attack of plague.

Anchezar (p. 313) studied the avirulent E.V. strain of *Past. pestis* isolated by Girard in Madagascar. Except in large doses it does not cause death in the very susceptible guineapig, and it can be used as a living vaccine in man. Girard and Robic (p. 314) claim an 80 per cent. reduction in mortality from plague in Madagascar as a result of the use of this E.V. living vaccine in over 2 million vaccinations during the previous 3 years. Passa (p. 314) gives figures of these vaccinations. A reduction in the incidence of plague from 3,493 cases in 1935 to 918 in 1937 is reported, and Robic (p. 314) carries the incidence figures to 596 in 1937–1938.

Meyer (p. 315) shows that 12 species of wild rodents carry sylvatic plague and considers that North America will remain a permanent plague focus. He also (p. 315) describes two cases of sylvatic plague in California and details the measures advised to prevent this disease. Fumigation by methyl bromide is efficient in controlling burrow rodents and their fleas. Stewart and Mackie (p. 316) also report favourably on methyl bromide, which kills both rodents and fleas. It is dangerous to those using it unless they are trained, but may be used with grain without rendering it toxic. *C. W.*

RAGHAVENDER RAO (S.). **Some Epidemiological Features of Plague in Bengal with Special Reference to Calcutta.**—*Indian Med. Gaz.* 1938. Nov. Vol. 73. No. 11. pp. 671–676. With 2 figs. (1 map).

The observations here recorded of old epidemics which have visited Calcutta and which may or may not have been plague illustrate how meagre is the material on which a history of such an important visitation can be founded. It is interesting to note that plague in Calcutta came there directly from Hong Kong and not from Bombay.

W. F. Harvey.

VINE (R. S.). **Plague in the Nilgiris.**—*Jl. Roy. Army Med. Corps.* 1938. Dec. Vol. 71. No. 6. pp. 382–395.

The Nilgiri Hills of Southern India are formed by the junction of the Eastern and Western Ghats and have an average height of about 6,500 feet. They are very salubrious in their upper levels and the occurrence of plague in these regions is unusual and "worthy of note." No peculiar features presented themselves in the course of the epidemic visitation and the importation of the infection was through merchandise coming by road from the plains below. Concealment of the earliest human cases led to some delay in the diagnosis of plague so that in Ootacamund, although a case was admitted to hospital on July 30th and died, it was not until the fourth case, admitted to a venereal ward, had died and post-mortem examination revealed *Past. pestis* that plague, which had been suspected, was positively declared. "The subsequent spread of the epidemic proved clearly that infection travelled with bags of grain or millet from grain-store to grain-store. All the early human cases had a definite association with some grain-store or shop."

In Ootacamund "unusual mortality amongst rats was not brought to the notice of the authorities till August 12th." Positive rats were reported in Coonoor, 8 miles directly distant from Ootacamund, on August 18th. A plague positive rat was discovered in the cantonment of Wellington 1½ miles from Coonoor on September 23rd. Active measures were instituted in Wellington, of which the details are given. Cyanogas and calcid were used as disinfectants, shelltox and flit as pulicides. Only 7 human cases were observed in the cantonment hospital and two of these ended fatally. No single case occurred among the military population and the disease rapidly disappeared from the cantonment, which was declared free from plague on February 5th, 1938.

W. F. H.

UTTLEY (K. H.). **The Epidemiology of Bubonic Plague in Hong Kong.**—Reprinted from *Caduceus.* Hong Kong. 1938. Feb. Vol. 17. No. 1. 20 pp. [15 refs.]

Hong Kong has generally been given as the place where the present plague cycle made its first appearance. It is not difficult to show that this is an error for it "started very much earlier and most probably in Central Asia." In 1894, however, the sanitary state of Hong Kong was very bad indeed and when plague broke out there the conditions were all favourable to its assumption of epidemic proportions. The author has restricted his survey to the urban Chinese population and has made personal investigation of every death return from 1894 up

to 1923, which was the last year in which epidemic plague occurred. Many interesting statistical facts are recorded in tables :—table I : standardized death rates for census years and crude death rates for each year ; table II : age-incidence of plague deaths in 1901, because this was a census year ; table III : plague deaths expressed as a percentage of deaths from all causes in their age groups ; and table IV : seasonal distribution of plague 1894–1923. Other tables follow with calculated coefficients of correlation between plague and the five main climatic factors—relative and absolute humidity, monthly mean temperature, rainfall, and barometric pressure. It is not easy to ascribe the diminution in the severity of plague to improved sanitation since the severity of plague has diminished everywhere in South China with or without sanitation betterment. Conclusions are come to which appear somewhat contradictory :—

"Climatic conditions favour the spread of plague in Hong Kong in the spring and early summer. When the mean temperature rises to **63°**, the relative humidity to **83°**, and the tension of aqueous vapour to **0·500**, epidemics are likely to occur. When these factors approach respectively the values of **82°**, **83°** or more for three to four months and **0·900**, the disease tends to die out. Inasmuch as these factors have often prevailed in non-epidemic years, and indeed when there has been no case of plague . . . . . it is necessary to look for other causes which may govern the appearance of plague, either in epidemic or sporadic form in Hong Kong."

W. F. H.

BUXTON (P. A.). **Quantitative Studies on the Biology of** *Xenopsylla cheopis* **(Siphonaptera).**—*Indian Jl. Med. Res.* 1938. Oct. Vol. 26. No. 2. pp. 505–530. With 3 figs. & 2 graphs. [22 refs.]

The biology of tropical rat-fleas has been studied by insect physiologists under laboratory conditions and the " flea count " in the field has been thought to provide a rough guide to the state of natural populations from time to time. But more exact studies in population growth, making use of laboratory technique for breeding the fleas and the control of climate, though leaving the rodent-flea relationship as natural as possible, have only recently been attempted. The present paper describes the results of 27 experiments made in order to discover the climatic conditions under which fleas live and multiply most easily.

The apparatus, which is quite new and which with slight modifications may perhaps be used for other problems, is described in great detail. It consists essentially of a " synthetic mouse-hole "—a rectangular glass chamber 18 cm. × 12·5 cm. × 13 cm. with a copper lid waxed into position and carrying inlet and outlet pipes for air, thermometer, hygrometers, etc. Into this chamber, which is kept in an incubator at constant temperature, are placed a mouse and its bedding, together with the fleas (*Xenopsylla cheopis*). Air, brought to the required humidity by either KOH or H_2SO_4 solutions, is passed through the chamber. Many difficulties in the control of humidity have been overcome and are described ; among other precautions it is necessary to use a mouse of standard weight and to maintain a constant rate of air flow. Then, in spite of the water given off by the mouse it is possible to control humidity so that there is no more than an 8 per cent. variation in different parts of the chamber. It is thought that the humidity in the bedding is very little in excess of that of the atmosphere above it.

When the mouse has occupied the apparatus for three days, adult fleas, from 15 to 50 of each sex, are introduced (P (parental) generation). They feed on the mouse and breed in the bedding. After a definite period, from 7 to 18 days in these experiments, the fleas are counted and the bedding incubated at the temperature and mean humidity of the experiment until all the first filial generation (F) adults have emerged. Many P fleas are eaten by the mouse, but assuming their decrease to be logarithmic, an estimate of the number surviving at any day can be made, and experiments of different duration compared. It is stressed that, owing to the small number of experiments, the conclusions are tentative; they may be briefly summarized as follows :—

P generation.

A high mortality is due to fleas being eaten by the mouse, but survival was affected neither by temperature nor humidity over the ranges used (24° to 32°C.; 30 per cent. to more than 90 per cent. R.H.). It is thought that in dry air water loss is compensated by frequent blood-meals. The original density of population has no effect on the proportion surviving. When an experiment is concluded the proportion of fleas on the mouse is determined. This may vary between 4 per cent. and 28 per cent. of the total and it is affected neither by temperature nor humidity. When the sexes are present in equal numbers, significantly more females than males have been found on the mouse.

Production of F fleas.

Eighty per cent. of the emergences occur between the 24th and 38th day after the commencement of the experiment, and they tend to be sooner at higher than at lower humidities. The production of F fleas per P♀ day is greater at higher humidities and at high temperatures. At very high humidities mould appears and there is a total mortality in the F generation. It is probable that low humidity is unfavourable during larval life, when spiracular control is less efficient and when water may be lost through the cuticle. Possibly the larvae feed only when the proportion of water in the bedding exceeds a certain value.

In conclusion, the author calls for a more critical study of the flea count; for his experiments suggest that, as yet, it gives no reliable estimate of the fluctuations in the total flea population since it assumes that the population of fleas on the rat bears a constant relation to the total population. It is urged that the climate in rat-holes and harbourages should be studied, for it would be interesting to know if mortality of fleas is high in nature in view of the nearly saturated atmosphere found by the author in rat-holes [this *Bulletin*, 1932, Vol. 29, p. 838].

It is important to know also about the temperature in the holes, since fleas may possibly tolerate a drier atmosphere at the higher temperatures, for then the adult stage, with its greater tolerance of humidity variations, is reached more quickly.

It is hoped too, that the " synthetic mouse-hole " will be used in the future with rats and that the period of the experiments will be extended to cover the whole life of the P generation. Very high relative humidities should be studied, with a drainage system (plaster of Paris on

the floor of the chamber ?) similar to those occurring in natural rat-holes. The use of baby rodents has also been tested : the mortality among adult fleas is then very slight (but we understand that the fleas lay few eggs). *C. G. Johnson.*

RAMOS DÍAZ (Arquimedes). Epidemiología de la peste bubónica en la sierra del Departamento de Lambayeque. [**Epidemiology of Plague in the Mountainous Region of Lambayeque.**]—*Bol. Oficina Sanitaria Panamericana.* 1938. Sept. Vol. 17. No. 9. pp. 776–781.

A small epidemic of plague occurred in a small village in the mountainous region of Lambayeque in Peru. It has formed the basis of a study of the mode of transmission of plague in that district. The disease was proved to be human plague by disinterring the body of a fatal case two months after burial and examining the bone marrow from a rib, microscopically, by culture and by animal inoculation. In the region of the epidemic the presence of *Rattus rattus*, which is the common reservoir of plague on the Peruvian coast, has been demonstrated together with its plague vector, *X. cheopis*. In the mountains, however, rodent plague is found in the cui, a species of guineapig. Contact is made between cuis and rats, which accounts for epizootics in the former. Now the flea *Pulex irritans* has adapted itself as a parasite of the cui and it is this flea which is considered to have transmitted plague in this instance to human beings. *W. F. H.*

LANDAUER (E.). Rapport sur la peste dans l'île de Hainan. [**Report on Plague in Hainan.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 752–760.

GIRARD (G.). Identification du bacille pesteux par l'inoculation au cobaye des sérosités de ponctions diluées dans l'eau salée (à propos des remarques formulées par M. BROQUET). [**Identification of the Plague Bacillus by Inoculation of the Guineapig with Puncture Material Diluted with Salt Solution.**]—*Bull. Soc. Path. Exot.* 1938. July 6. Vol. 31. No. 7. pp. 669–677.

The point made in this communication and illustrated by experimental data, is that more certain and quicker results are given by subcutaneous injection of a suspension of test material in salt solution than by application to the shaved skin. One advantage of the salt solution over more nutrient fluids is that post-mortem organisms do not multiply in it. *W. F. H.*

ESKEY (C. R.). **Fleas as Vectors of Plague.**—*Amer. Jl. Public Health.* 1938. Nov. Vol. 28. No. 11. pp. 1305–1310.

Many important data regarding the conditions under which plague is transmitted to man by fleas are contained in this article. These are presented in condensed form and can only be still more concisely summarized.

It is only shortly before the death of an animal that the blood septicaemia is sufficiently intense to infect fleas. In the flea itself, which has taken up plague blood, infectivity is not developed as long

as that blood can still pass into the stomach. Only the "blocked" flea—that is, one in which bacterial proliferation has occurred in the proventriculus with obstruction—is infective by the regurgitation of organisms into the wound made by the insect bite. "In the course of experiments fleas have transmitted plague as early as five days and as late as 147 days after they had ingested *P. pestis*." On the other hand the period of infectivity is short, for the flea does not usually survive obstruction more than 24 to 48 hours.

The species of rat flea *Xenopsylla cheopis* is the most active and dangerous of the flea vectors, but *Nosopsyllus fasciatus* is also highly capable of transmitting plague. Although all species of fleas "do not have the same ability to transmit plague" it is probable that any flea, regardless of species, feeding on septicaemic blood may become infected and may be a potential vector.

It used to be held that man might be infected with plague by means of flea faeces rubbed into the wound. While this view has been discarded for man in favour of regurgitation infection, it probably holds good for the rodent and it is well to remember that "*P. pestis* may retain its virulence as long as four weeks in dried faeces."

Sylvatic plague has assumed considerable importance of recent years for epizootic spread and yet "there is little knowledge regarding the facility with which wild rodent fleas will attack humans." It would seem probable that all rodent fleas have to be starved before they prefer human blood to that of their natural hosts and that wild rodent fleas "are not nearly so dangerous to man as the domestic rat fleas, *Xenopsylla cheopis*." *W. F. H.*

MAYFIELD (R. B.). **Rat-Fleas in Plymouth.**—*Parasitology.* 1938. Sept. Vol. 30. No. 3. pp. 314–319. With 1 fig.

The investigation related only to "a certain section of the docks in Plymouth" which were separated by town dwellings from other dock premises. More extensive surveys in Liverpool have shown that *Xenopsylla cheopis*, *Nosopsyllus* (*Ceratophyllus*) *fasciatus* and *Leptopsylla musculi* were the prevalent species there. In London the most common species was *Nosopsyllus fasciatus*, although *Leptopsylla musculi*, *Ctenophthalmus agyrtes* and *Ctenocephalus felis* were present in fair numbers. In conducting the research the live rats were chloroformed and the fleas obtained by combing the rat. Three species were found :—*Nosopsyllus* (*Ceratophyllus*) *fasciatus*, *Xenopsylla cheopis* and *Leptopsylla segnis* (*musculi*). "The findings of *Xenopsylla cheopis* were almost entirely confined to a certain grain store." *W. F. H.*

PISTONI (Ferruccio). Fauna murina in Eritrea e nello Scioa. Ricerche parassitologiche. [**Murine Fauna in Eritrea and in Scioa.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1938. July. Vol. 19. No. 7. pp. 388–394.

A survey has been made by the author of the rats together with their ecto- and endoparasites in the seaport of Massaua, in Asmara, a town in the highlands of Eritrea, and in Addis Ababa. In Massaua out of 200 rats captured 187 were *Mus rattus rattus* and 13 *Mus rattus*. No rats of the species *Mus norvegicus* (*decumanus*) were caught. In the

highlands of Eritrea and of Scioa there was a slight preponderance of *Mus rattus* over *Mus rattus rattus* and *Mus musculus*. Ectoparasites in the plains of Eritrea were represented by *Xenopsylla cheopis* and *Nosopsyllus fasciatus*, but the parasitic index was low during the hot weather whereas it was higher and more constant in the hills. The endoparasites specially noted in both hills and plains were *Giardia* and *Trypanosoma lewisi*. *W. F. H.*

ALI (P. Mohamed). **A Rat-Flea Survey of Mattanchery (Cochin) (1937).**—*Indian Med. Gaz.* 1938. July. Vol. 73. No. 7. pp. 409–412.

OTOMO (T.), KOGA (S.) & TANAKA (I.). Les rats et leurs puces dans les entrepots douaniers de Kobé. [**The Rats and their Fleas in the Customs' Depot of Kobe.**]—*Bull. Office Internat. d'Hyg. Publique.* 1938. July. Vol. 30. No. 7. pp. 1435–1436.

It is to be expected that the species of rats found on board ship will differ significantly from those on shore. The storage depots of the Customs have an intermediate position in this respect, as the present incomplete investigation, lasting from 1st to 25th October, shows. A proportion of 70 marine to 30 shore rats was found. According to species there were, in percentages, *Rattus rattus alexandrinus* 71·57, *Rattus norvegicus* 11·20, *Rattus rattus rattus* 9·90, and *Mus molossinus molossinus* 7·26. The fleas found on the rats were in the percentage proportions: *Xenopsylla cheopis* 75·62, *Ceratophyllus fasciatus* 21·07, *Ceratophyllus anisus* 1·36, *Leptopsylla musculi* 0·56, and *Echidonophaga gallinacea* 1·36. The *cheopis* index in the depots was about 4·2.

W. F. H.

GUIMARÃES (L. R.). Sobre a incidencia de pulgas em ratos na cidade de Santos. [**Fleas on Rats in Santos.**]—*Ann. Paulist. Med. e Cirurg.* 1938. Sept. Vol. 36. No. 3. pp. 283–289. With 3 graphs.

A total of 2,098 rats and 3,906 fleas was examined in Santos on the coast of Brazil. The rat species *Epimys norvegicus* made up 80·36 per cent. of the total with flea index 1·73; the predominant flea, 46·67 per cent., was *Xenopsylla cheopis*. *W. F. H.*

RISTORCELLI (A.). Les rongeurs sensibles à la peste dans la région du Nefzaoua. [**Rodents Susceptible to Plague in the Region of Nefzaoua.**]—*Arch. Inst. Pasteur de Tunis.* 1938. Sept. Vol. 27. No. 3. pp. 298–303. With 1 map.

The region of Nefzaoua in Tunis is a strip of country stretching from beyond the salt lagoon of Shott el Djerid in the North to Ghadames in the South and having the Algerian frontier on the West. Rodents found in this territory are the dormouse, *Psammomys* and merions, gerbils, *Mus musculus*, *Rattus alexandrinus*, jerboas and *Ctenodactylus gundi*. Gerbils and *Psammomys* predominate. Although human plague has not been known since the French occupation it is said to have decimated the district a century ago. Epizootics are described by the natives and are said to be due to ticks of the genus *Hyalomma*. If epizootic plague did make its appearance it would probably spread rapidly. *W. F. H.*

MORGAN (M. T.). Mémorandum publié par le Ministère Britannique de l'Hygiène sur la méthode à suivre pour l'examen des rats au point de vue du diagnostic de la peste. [**Departmental Method of examining Rats for Plague.**]—*Bull. Office Internat. d'Hyg. Publique.* 1938. July. Vol. 30. No. 7. pp. 1437–1439.

(1) Attach the dead rat to a board, belly upwards. (2) Reflect the skin from the jaw to pubis and search for cervical, axillary and inguinal lymph nodes, not forgetting that there are sex glands in front of the pubis which may normally contain numerous small bipolar bacilli. (3) Note the presence of subcutaneous haemorrhage or congestion. (4) Dissect out every suspicious lymph node and section it. (5) Make films and examine microscopically if any sectioned surface suggests necrosis. (6) Open the abdomen and remove small pieces of tissue from liver and spleen after sterilizing the surface by cauterization. (7) Fix films made from suspicious lymph nodes in the flame ; treat with absolute alcohol ; stain with carbol-thionin under gentle heat and wash in tap water. (8) Examine for bacilli with bipolar staining. (9) Take portions of tissues such as nodes, liver, spleen, etc., in any case which has shown bipolar bacilli for test culture and inoculation into a guineapig. (10) Sow the fragments of tissue, without making into suspension, directly on well dried ordinary nutrient agar plates. (11) Inoculate the guineapig subcutaneously at a shaved spot on the abdomen to the left of the middle line. (12) Send material such as the rat organs or culture, which have proved suspicious of plague infection, to the Ministry of Health Laboratories, London, whose duty it is to confirm the suspicion. (13) Take all precautions to have this material, in a carefully corked wide-mouthed bottle surrounded with sawdust, packed in a tin box. (14) Send a telegram in advance to notify the Minister of Health. *W. F. H.*

ROBIC (J.) & MINEC. Note sur un cas de peste bubonique, compliqué de pyomyosite à bacille de Yersin. [**Case of Bubonic Plague complicated by Plague Abscesses in Muscles.**]—*Bull. Soc. Path. Exot.* 1938. July 6. Vol. 31. No. 7. pp. 679–682.

The patient was a young man of 21 years who developed plague and buboes in both inguinal regions. That on the left side opened spontaneously and discharged abundant pus. The iliac lymph nodes were secondarily affected and suppurated also. Death occurred suddenly 17 days after the appearance of the first bubo, from haemorrhage due to ulceration into the femoral or iliac artery. There is nothing very extraordinary in this history. What was quite unusual, however, was the development of intramuscular abscesses in both upper and lower extremities. Two of these were aspirated before they had opened and yielded in the one case a pure culture of *Past. pestis* and in the other *Past. pestis* along with *Staph. albus*. A reference is made to the presence of this latter organism, either in the category of a contaminant or as having a more causative rôle. The case may be described as one of plague pyomyositis. *W. F. H.*

ANCHEZAR (Benjamin V.). Estudio bacteriológico y anatomopatológico de la infección experimental con *Pasteurella pestis*. (Cepa E.V. avirulenta de Girard.) [**Experimental Study of Plague Strain E.V.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1938. Aug. Vol. 8. No. 2. pp. 196–227. With 5 figs. on 3 plates. [27 refs.]

A strain of plague was isolated by GIRARD in Madagascar which is not merely avirulent but can be used as living vaccine in man. The

present study has been directed to following out the effects of this living E.V. strain on the very susceptible guineapig. Conclusions arrived at are : 1. The E.V. strain which was isolated from a patient with bubonic plague is identical in all respects with *Past. pestis.* 2. The living E.V. strain is avirulent for the guineapig in small or medium doses whether administered subcutaneously, intraperitoneally, intratracheally or by the mouth. 3. In large doses (of 250,000 million organisms) it causes death in guineapigs and rats by toxic action. 4. Experimental infection has shown that E.V. bacteria (a) have selective effect on the lymph nodes and spleen, (b) are temporarily present in the blood and bone marrow, and (c) persist for a considerable time at the site of inoculation. 5. The inoculation gives rise to localized inflammatory lesions, such as regional adenitis and peritonitis and temporarily to more general lesions of infective type. *W. F. H.*

GIRARD (G.) & ROBIC (J.). Vaccination antipesteuse par germes vivants (virus vaccin E.V.). Trois années d'application à Madagascar. [**Plague Prophylaxis with E.V. Living Vaccines.**]—*Bull. Acad. Méd.* 1938. July 5. 102nd Year. 3rd Ser. Vol. 120. No. 26. pp. 54–60. With 1 chart.

Many communications by the authors have been noticed on this subject (this *Bulletin*, 1934, Vol. 31, p. 885; 1935, Vol. 32, p. 850; 1936, Vol. 33, pp. 366, 877 ; 1937, Vol. 34, p. 408 ; 1938, Vol. 35, p. 209). The summary here given is : A huge programme of plague prophylaxis by means of living avirulent E.V. vaccine has been carried out during the past three years and over 2,000,000 vaccinations have been performed. The killed vaccine which was originally used had given mediocre results. With living vaccine on the other hand an 80 per cent. reduction of mortality is claimed. *W. F. H.*

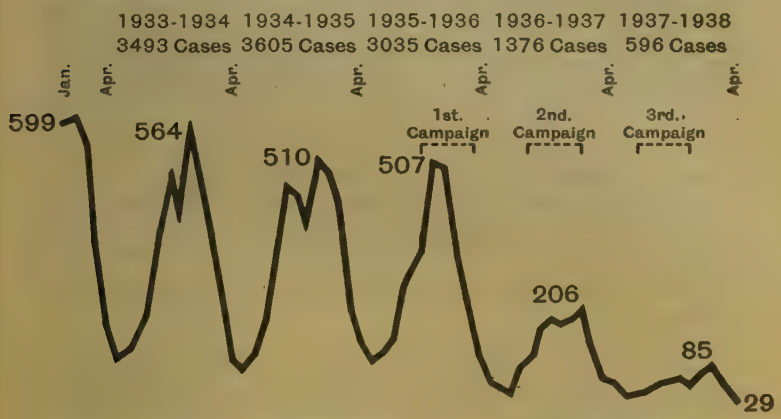
PASSA. Prophylaxie de la peste à Madagascar. [**Prophylaxis of Plague in Madagascar.**]—*Bull. Office Internat. d'Hyg. Publique.* 1938. July. Vol. 30. No. 7. pp. 1440–1441. With 1 chart.

Plague has been present on the High Plateau since 1921. From the year 1935 large scale prophylactic inoculation of living plague vaccine has been carried out with the result that in the three years, 1935 to 1937, there were performed 500,000, 711,039 and 815,453 single dose vaccinations respectively and corresponding reported cases of plague were 3,493, 2,007 and 918. This represents a notable reduction. *W. F. H.*

ROBIC (J.). Film cinématographique sur la vaccination antipesteuse à Madagascar. [**Cinematograph Film of Antiplague Measures in Madagascar.**]—*Bull. Soc. Path. Exot.* 1938. Oct. 12. Vol. 31. No. 8. pp. 690–691. With 1 fig.

A film of plague work has been shown in country districts of Madagascar with the final projection on the screen of a graph to illustrate the results of vaccination with the living E.V. strain of plague bacillus. This graph is reproduced below and shows for the five years 1933 to 1938 the number of cases of plague to have been 3,493, 3,605, 3,035, 1,376 and 596 respectively. The E.V. vaccine, first introduced in November 1935, has in three separate campaigns of inoculation

made, as is shown graphically, a solid impression on the case incidence of plague. The final figure (596) for 1937–38 is to be compared with a mean annual incidence of plague for the years preceding this vaccination campaign of 3,500. It will be interesting to see how much lower the graph may descend.



Course of plague in Madagascar in the five years 1933 to 1938, showing the results of vaccination with the living E.V. strain between 1935 and 1937.
[Reproduced from the *Bulletin de la Société de Pathologie Exotique.*]

W. F. H.

Rosier (H. J.). Verslag betreffende de pestbestrijding op Java over het jaar 1936. [**Antiplague Measures in Java during 1936.**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1938. Vol. 27. Supplement. 84 pp. With 13 graphs & 9 maps & sketch maps.

Macchiavello (A.) & Contreras (Manuel). Estudios sobre peste bubonica. IV. Diez años de lucha anti-pestosa, 1928–1937. [**Bubonic Plague. Ten Years of Antiplague Measures 1928-1937.**]—*Rev. Chilena de Hig. y Med. Preventiva.* 1938. Apr.–June. Vol. 1. No. 4–6. pp. 183–189. [10 refs.]

Meyer (K. F.). Sylvatische Pest. [**Sylvatic Plague.**]—*Schweiz. Med. Woch.* 1938. Aug. 6. Vol. 68. No. 32. pp. 925–928.

The history of plague in San Francisco and California is one of ebb and flow but never of final disappearance. Here too the importance of sylvatic plague was discovered and the importance of persisting, though sometimes latent, infection among ground squirrels. Some twelve species of wild rodents have been incriminated in sylvatic plague, species of the genera *Citellus, Marmot, Entamias, Cynomys, Peromyscus* and *Neotomia.* It is depressing to read, though probably true, that " no doubt remains that North America from now on will remain a permanent plague focus." *W. F. H.*

Meyer (K. F.). **Sylvatic Plague.**—*Amer. Jl. Public Health.* 1938. Oct. Vol. 28. No. 10. pp. 1153–1164. With 1 fig.

This article is a report on the subject of sylvatic plague by the chairman of the Sylvatic Plague Committee. Two human cases of

plague, contracted presumably from wild rodents, are described. In the one case the rodent was not identified, although " fleas carrying plague bacilli were discovered in the region." The other case gave a history of having been bitten by a chipmunk (*Callospermophilus* (*Citellus*) *chrysodeirus*) and it was reported that an epidemic disease had been prevalent among the rodents of the area. Some of the recommendations made as a result of the occurrence of human cases are : the use of lymph node punctures for diagnosis in doubtful cases ; the use of antiplague serum ; rodent proofing of summer houses ; warning to residents " not to touch or play with chipmunks or other rodents " ; reporting of noteworthy rodent mortality ; prohibition of sale of chipmunks, golden mantled squirrels or other rodents until after two weeks' quarantine.

Special consideration is given to latent rodent plague and to the method of its detection by mass inoculations of tissues or fleas by the pool method. Reference is made also to the skin tests and serological procedures used by Russian investigators to detect invisible plague in rodents.

Under the heading scientific investigations some important results are listed :—

" (*a*) The rodent population in a plague area in the California mountains . . . varies from 27 to 117 individuals per acre . . . Trapping small areas is followed within two months by recovery to a considerable fraction of the original numbers. (*b*) Rodent control over a narrow belt is soon followed by re-invasion . . . (*g*) Experimental studies have shown that methylbromide administered at the rate of 10 cc. per burrow opening, is very efficient in controlling both burrow rodents and their fleas. This fumigant of course must be used with the customary care accorded to all highly toxic gases."

W. F. H.

De la Barrera (Jose Maria) & Corica (Pablo). Peste rural en Mendoza. [**Rural Plague in Mendoza.**]—*Folia Biol.* Buenos Aires. 1938. Feb.–Mar. Nos. 83–84. p. 353.

Stewart (M. A.) & Mackie (D. B.). **The Control of Sylvatic Plague Vectors.**—*Amer. Jl. Hyg.* 1938. Nov. Vol. 28. No. 3. pp. 469–480. [14 refs.]

The flea is not only a vector of plague but may be a reservoir also, so that measures for the eradication of sylvatic plague must aim at killing off not only the rodents concerned but their fleas as well. Much of the work already done on this subject has been directed to the burrowing rodents and to the disinfection of their burrows. In methyl bromide, apparently, a substance has been found which will kill both the rodent and its fleas, whereas hydrocyanic acid has not been so efficient in this respect. Experiments were undertaken to test a number of fumigants in a specially constructed apparatus : ethylene dichloride ; ethylene oxide ; propylene oxide ; dicrotynal maleate ; sulphur dioxide ; methyl bromide ; hydrocyanic acid gas ; carbon monoxide ; 1, 4-diethylene oxide ; di-chlorethyl ether ; carbon disulphide and chloropicrin. " Because of the deficiencies of hydrocyanic acid gas and since methyl bromide was next highest in efficiency in the laboratory tests, all further investigations were confined to the latter." The fleas used were taken from the Douglas ground squirrel

(*Citellus beechyi*) and belonged to the species *Diamanus montanus* and *Hoplopsyllus anomalus*. In the field about 10 cc. of liquid methyl bromide per burrow opening is used. It is well to recognize, however, that methyl bromide is colourless and odourless and has poisonous action. Care must be taken then by the trained operators in using the fumigant lest they come accidentally in contact with the chemical and receive burns or breathe its fumes, which are to some extent toxic. The authors have experimented with grain and tests show that food materials are not rendered toxic by the fumigant. It is probable, therefore, that methyl bromide could be used satisfactorily for the fumigation of cargoes. *W. F. H.*

HELMINTHIASIS.

Précis of Abstracts in this Section.

Kaufmann (p. 319) shows that Ascaris is found in 3 per cent. of corpses in Dresden. Winfield and Chin (p. 319) emphasize the importance of the pollution of the household environment, in both urban and rural districts in China, in the maintenance of Ascaris infestation. Pollution by children is especially noteworthy. Dempster (p. 320) considers that the improvement in worm infestation shown in a recent compared with a previous survey in Samoa is due to mass treatments.

Basnuevo & Anido (p. 320) give a technique for counting eggs. Faeces are suspended in 1 per cent. HCl and sieved.

Sang (p. 321) shows that a watery extract of Ascaris contains a protease which inhibits the action of trypsin.

Voegtlin (p. 321) describes an ascaris in the oesophagus removed through the mouth, Millan and Nespolo (p. 321) a case of suffocation due to these worms in the trachea, Zahawi (p. 321) a case of intestinal obstruction, and Rajahram (p. 321) one of multiple liver abscesses, due to Ascaris. Kō (p. 322) saw a girl of 2½ from whose umbilicus 16 of these worms escaped.

Maplestone and Mukerji (p. 322) discuss the treatment of ascariasis by oil of chenopodium combined with santonin. Chenopodium in doses graded in the usual way according to age is less successful for children than for adults.

Doubrow (p. 322) describes hookworm disease in the miners in the Loire. Most show no symptoms but some are gravely ill. Treatment is by thymol.

Díaz (p. 323) found helminth infestation in 41 per cent. of children in Resistencia (Chaco). Hookworm was the most frequent. Pessôa and Pascale (p. 323) working on estates in São Paulo found 80·5 per cent. infected by Necator. Heavier infection was found in those whose dwellings had no latrines than in those possessing them. Treatment was by tetrachlorethylene and other drugs.

Scott (p. 324) shows that overt blood loss leads rapidly to iron deficiency. Available iron stores are equivalent to about half the haemoglobin and may repair anaemia from blood loss quickly, but this can only happen once and thereafter even small haemorrhages may produce anaemia rapidly, unless the iron store is replaced. This explains why anaemia and amount of hookworm infection are often not parallel. The commonest cause of overt blood loss is probably hookworm disease.

Castillo Odena (p. 325) shows the importance of treating children for ankylostomiasis in the schools in the Argentine.

Aketagawa (p. 325) concludes that canine hookworm larvae, when swallowed, penetrate the wall of the alimentary canal. v. Brand and Otto (p. 325) found a low glycogen content in *A. caninum* and that infection had no effect on the carbohydrate metabolism of the host.

Khalil (p. 326) believes that the periodicity of the microfilariae of *W. bancrofti* in the blood depends upon the site of the adults in the human body, and that day and night postures are factors in controlling

lymph flow. An explanation of the common occurrence of *W. bancrofti* in the lymphatics of the spermatic cord, depending on the warmth of the tissues, is given.

GALLIARD (p. 328) in two post-mortems found no evidence to support the view that autoinfection by Strongyloides is common.

RAMOS E SILVA (p. 328) gives a local treatment of chenopodium, wintergreen and gomenol for larva migrans.

JONES (p. 328) gives instructions for the use of the cellophane NIH swab in the diagnosis of Enterobius infection, but REARDON (p. 328) calls attention to artifacts resembling the ova, which frequently occur in the cellophane. She also (p. 329) gives numbers of eggs counted in the gravid females. MARSHALL and WOOD (p. 329) consider that Enterobius caused an ischio-anal abscess in a boy. WRIGHT and BRADY (p. 329) found gentian violet efficient in treatment of threadworm infection. *C. W.*

KAUFMANN (W.). Ueber Wurmerkrankungen. [**On Helminthic Diseases.**]—*Med. Klin.* 1938. June 17. Vol. 34. No. 24 (1747). pp. 810–811.

As to Ascaris, it is noted that in Dresden it is found in 3 per cent. of corpses at most. The work of MAY at Lahr in Baden showed about a quarter of the people there infected [this *Bulletin*, 1938, Vol. 35, p. 668]. The difference is considered. In the treatment of threadworms, in which the fingers are emphasized as conveyors of eggs from anus to mouth, an ointment of percaine with menthol is advised, as well as the anointing of the anus before a stool with zinc ointment, and the taking of slops as food. Evidence of their value is not offered.

Clayton Lane.

WINFIELD (Gerald F.) & CHIN (Ta-hsiung). **Studies on the Control of Fecal-borne Diseases in North China. VI. The Epidemiology of *Ascaris lumbricoides* in an Urban Population.**—*Chinese Med. Jl.* 1938. Sept. Vol. 54. No. 3. pp. 233–254. With 1 graph.

"The environmental studies indicated that the pollution of the household environment is probably the most significant factor in maintaining the ascaris infestation of the city just as it is in the country . . . . It seems to me that the part children play in polluting the environment cannot receive too much emphasis."

The stools were from 2,751 civilians in and around Tsinan and from 393 soldiers of the Shantung provincial forces. The following figures show in order the class of person examined, their numbers and the percentage of infection discovered by Stoll's egg counting method for Ascaris, hookworm and Trichuris. Children in 6 primary schools, 895, percentages 43·9, 1·1, 3·2; students in the Provincial School of Dramatics, aged 7 to 30, total 133, percentages 44·4, 12·7, 3; middle schools students mostly aged 10 to 19, total 503, percentages 22·7, 3·6, 4·6; college students, total 173, percentages 15·6, 1·7, 10·9; nurses, total 47, percentages 38·3, 0, 10·6; hospital patients, total 416, percentages 31·7, 8·4, 5·5; in city families, total 584, percentages 39·7, 1·9, 2·1; soldiers, 393, percentages 8·1, 26·7, 4·2.

For studies of environment 37 families were selected in Tsinan, 15 lightly and 22 heavily infected, with total members of 77 and 116, the infection rates for Ascaris being 14·3 and 66·4. Of soil samples

taken for examinations the percentages of those positive for Ascaris eggs were—in courtyards 37·5 and 75, in rooms 38·5 and 57·1, in streets 83·3 and 40. Most latrines had as receptacle a small brick-walled pit cleaned every 5 or 6 days; "one family had a septic tank into which they flush their sewage by means of a bucket of water poured into the latrine" and this family was one of the most heavily infected. In no latrine was the pit covered, flies were seen in all but 4 and dogs and chickens had access to all but 6. Of the 22 heavily infected families 12 had children who defaecated in the courtyard, from the 15 lightly infected families no such report came. *C. L.*

DEMPSTER (G. O.). **Intestinal Parasites in Western Samoa.**—*New Zealand Med. Jl.* 1938. Aug. Vol. 37. No. 200. pp. 214–218. With 1 fig.

The results are given of a faecal survey of racially pure Samoans in Western Samoa by a "slightly modified Willis technique of salt flotation."

The undescribed modification showed no infection by hookworm or Trichuris and almost none by Ascaris in babes under 1 year old. For these infections there was a sharp rise during childhood reaching 50 to 60, 40 to 50 and 18 per cent. respectively in adult life.

"Attention is drawn to a discrepancy between the rates of ascaris and trichuris infestations, which theoretically should be similar.

"An improvement on the previous state is shown. This may be partly due to the less accurate technique than that of Hopkins, but for all practical purposes it is accurate enough. An individual infestation with one hookworm is of academic interest only.

"Improvement must be due to mass treatments, as sanitary conditions in Samoa are static and have been for some centuries. Any improvement must be due to mass treatment, which therefore appears to be justified as regards expense and the only method at present at our disposal for the control of this disease."

"All authorities are agreed that the Willis technique is more accurate [than D.C.F.] in demonstrating ova of ascaris and trichuris." [As a worker, not as an authority, LANE found (this *Bulletin*, 1926, Vol. 23, p. 261) that, using the same quantity of centrifugal precipitate from the same faecal suspension, and floating with a salt solution of s.g. 1,200, the number of Ascaris eggs collected by one spin of D.C.F. averaged 1,415 (1,156 to 1,740), by Willis technique as used by Lambert 230 (32 to 586), by Willis technique when the eggs lost during Lambert's reversal of the slide were caught 333 (36 to 946). For Trichuris eggs in the same conditions the average for D.C.F. was 15 (12 to 18), for Lambert's modification of Willis 3·5 (0 to 10) and for the total Willis collection 9·8 (0 to 23).] *C. L.*

BASNUEVO (José G.) & ANIDO (Vicente). Conteo de huevos de helmintos. [**Counting Helminth Eggs.**]—*Rev. Med. Trop. y Parasit.* Habana. 1938. Mar.–Apr. Vol. 4. No. 2. pp. 85–87.

The technique consists of suspending faeces in 1 per cent. hydrochloric acid by the aid of glass beads and shaking, putting the suspension through a sieve, and counting an amount of it representing 0·0025 gm. of faeces. In an example given four such preparations showed Trichuris eggs varying between 3 and 6 and Necator eggs between 0 and

5. [The accuracy of the technique is in no way tested, and apart from the variation in eggs reported in the paper itself, it will be remembered that the mere straining of a suspension removes eggs.] *C. L.*

SANG (James Henderson). **The Antiproteolytic Enzyme of** *Ascaris lumbricoides* **var.** *suis.—Parasitology.* 1938. June. Vol. 30. No. 2. pp. 141–155. With 7 figs. [30 refs.]

A point for medical men is that *in vitro* a watery extract of Ascaris contains a readily diffusible protease, namely ascarase, which combines with trypsin and inhibits its action, an effect which presumably explains the inability to digest protein which may be present in this infection. *C. L.*

VOEGTLIN (Walter L.). **Some Novel Manifestations of Ascaridiasis.**—*Northwest Med.* 1938. June. Vol. 37. No. 6. pp. 182–183.

The unusual symptom was as of something crawling up through the chest to the level of the larynx and being stopped by rapid swallowing. Finally, on reaching to the back of her throat this woman of 26 pulled out a 7½ inch Ascaris. Caprocol brought away five worms, and the symptoms persisting, hexylresorcinol two more, after which they ceased. Excessive hunger had also been present. *C. L.*

MILLAN (Justo M.) & NESPOLO (Juan F. V.). Obstrucción traqueal por áscaris. [**Tracheal Obstruction by Ascaris.**]—*Prensa Méd. Argentina.* 1938. June 1. Vol. 25. No. 22. pp. 1070–1072. [28 refs.]

A child of 11 months died of suffocation, the result of several adult Ascarids in the trachea. There were also many in the stomach and intestine. *C. L.*

ZAHAWI (Shawkat). **Intestinal Obstruction and Atrophic Lesion of the Appendix caused by Ascaris.**—*Jl. Trop. Med. & Hyg.* 1938. Oct. 1. Vol. 41. No. 19. pp. 316–318. With 2 figs.

Some two pounds weight of Ascaris caused the death by intestinal obstruction of a boy of 10.

Though the obstructing worms lay in the small intestine, the appendix was enlarged to a length of 12 cm. and a breadth of 3·9 cm. [from the photograph figured, this latter was presumably measured with the appendix flattened] and contained four Ascarids, its wall being markedly thinned with the mucosa absent. *C. L.*

RAJAHRAM (S. G.). **A Case of Abscess of the Liver due to** *Ascaris lumbricoides.—Jl. Malaya Branch Brit. Med. Assoc.* 1938. Sept. Vol. 2. No. 2. p. 103.

A girl of 6 died with five Ascaris-containing abscesses in her liver. One had opened in the epigastric region, leaving a sinus from which three ascarids had escaped while she was under observation in hospital, at which time she had emaciation, fever and an enlarged liver. At autopsy there were still two worms in the cavity into which the sinus ran. The dilated and inflamed bile ducts showed other worms and there was one in the duodenum, though santonin during life had not led to the passage of worms. *C. L.*

Kō (Tōun). Ein Fall von Ausschlüpfung der Askariden durch die Mitte der Nabelgrube hindurch. [**Escape of Ascarids from the Navel.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1938. Apr. Vol. 37. No. 4 (397). [In Japanese pp. 758–762. With 4 figs. on 1 plate. German summary p. 763.]

A peasant girl, aged 2½, complained of abdominal pain for some two months. After the appearance at the umbilicus of a serous discharge, ascarids began to worm their way out of it, to the number of 16 during 35 days. She had no fever apart from malaria, and no colic. *C. L.*

Maplestone (P. A.) & Mukerji (A. K.). **The Treatment of Ascariasis.** —*Indian Med. Gaz.* 1938. June. Vol. 73. No. 6. pp. 326–328.

Treatments were by oil of chenopodium of B.P. standard and combined with santonin in varying doses.

The standard adult dose of oil of chenopodium was ♏ xv, and in general the efficiency of treatment, as judged by an unstated technique, lessened as its dose was diminished below 12 to 10 minims, and when the two drugs were given together its dose when reduced had a far greater effect in lessening the success of the treatment than had santonin. The lessening of the dose of oil of chenopodium for age, that is size, of a patient, as is the usual custom for drugs, is not successful, and it is pointed out on the one hand that the worms which are to be poisoned are of the same size whatever the size of the host, but that, the child's intestine being smaller, the reduced dose should give a proportionate concentration of the poisonous drug round the worm. A second suggested explanation is that as most intestinal helminths more readily infect young than old animals, it may be a matter of power to maintain position. [A third explanation is that after absorbing ascaridole the host's body produces from it, as it seems to do from santonin and thymol, the real anthelmintic substance, and that in the child these activities are less marked than in the adult. That the host's body does absorb and change ascaridole is shown by the report that after the administration of oil of chenopodium it disappears from the intestinal contents and that in the urine there is present glycuronic acid and a smell of thyme (Caius & Mhaskar, *Indian Jl. Med. Res.*, 1920, Vol. 7, pp. 570–609).] *C. L.*

Doubrow (S.). L'ankylostomose en pathologie du travail. [**Ankylostomiasis in Industrial Pathology.**]—*Arch. Maladies Professionnelles.* Paris. 1938. Sept.–Oct. Vol. 1. No. 4. pp. 298–305. With 2 figs.

In France, ankylostomiasis is a disease of underground workers, in Algeria and elsewhere in the French Colonial Empire it has no relation to industry. The infection cannot then be listed internationally as an industrial disease.

The paper deals essentially with French miners in the Loire and reports that of some 7,000 of them examined by the [uncontrolled] modification of Telemann's diagnostic method [this *Bulletin*, 1932, Vol. 29, p. 756, and 1933, Vol. 30, p. 262] 1,236 infections were discovered. Of these, 1,032 (83 per cent.) had no symptoms; 204 were anaemic, 31 of them gravely so, the other 173 being unfit for full work. Cure of the anaemias closely follows expulsion of the worms, it, however, not being stated what amount of haemoglobin the author

considers to be normal. Treatment is by freshly powdered thymol in cachets, three doses of 1 gram each at hourly intervals on each of three consecutive days or 9 grams (135 grains) in all, with a purge on the 4th day. Treatment is given in hospital and all stools after admission to hospital are kept, each man's in his own bucket, and sieved on the fifth day. Surface latrines permit of the miner easing himself before going underground. Apparently there are no underground latrines. *C. L.*

Díaz (Benito). El indice anquilostomiasico en la ciudad de Resistencia (Chaco). [**The Hookworm Index in the City of Resistencia (Chaco).**] —*Bol. Sanitario.* Buenos Aires. 1938. Apr. Vol. 2. No. 4. pp. 279–310. With 8 graphs & 3 charts.

Faecal examinations were made on 1,102 children in nine schools in the city of Resistencia. Percentages of detected infections were as follows: any helminth 41·1, hookworms 29·3 (11·1 to 43·8), *H. nana* 11·7, Trichuris 7·9, Enterobius 1·8, Ascaris 0·7, *T. saginata* 0·4.

Faecal examinations for presence of infection were by the Willis technique, for egg counting by that of Stoll, using 0·075 cc. With the intensity of infection present, the Stoll technique missed over 20 per cent. of them. On the method of calculation used, 30 per cent. of the children harboured ten, and over 70 per cent. less than a hundred parasites. There was no correlation between the estimated weight of infection and the anaemia induced. The clay subsoil of the Chaco favours hookworm infection. *C. L.*

Pessôa (S. B.) & Pascale (Humberto). Pesquisas sobre a ancylostomose em São Paulo. III. Intensidade da ancylostomose em algumas fazendas de café no municipio de Ribeirão Preto. [**Inquiries on Necator Infection in São Paulo. III. Its Intensity in Certain Coffee Estates in the Ribeirão District.**]—Reprinted from *Ann. Facul. Med. Univ. São Paulo.* 1937. Vol. 13. pp. 167–180. With 3 graphs. English summary.

—— & ——. IV. Analyse da infestação pelo Necator em uma fazenda de café e canna no municipio de Sertãozinho. [**IV. Analysis of Necator Infection in a Cane and Coffee Plantation in Sertãozinho District.**]—*Ibid.* pp. 181–210. With 4 graphs. English summary.

—— & ——. V. Observações sobre o tratamento da ancylostomose pelo tetrachlorethyleno, baseadas em contagens de ovos, antes e depois da administração do remedio. [**V. Treatment of Necator Infection by Tetrachlorethylene based on Pre-Treatment and Post-Treatment Egg Counts.**]—Reprinted from *Folia Clin. et Biol.* S. Paulo. 1937. Vol. 9. No. 6. pp. 165–169.

III. In 626 persons from whom 0·005 gm. of faeces were examined by the Stoll-Hausheer caustic soda solution method, this technique displayed necator infection in 80·5 per cent. The greatest weight of infection, judging by egg counts was between 15 and 19 years, the diminution after 20 being held to be evidence of acquired age resistance. This method of examination disclosed 81·4 per cent. of men infected, with an average of 2,276 eggs per gm., the figures for women being 79·4 and 2,736.

The few figures available suggest that those who do and those who do not work in the plantations are equally infected.

IV. In Fazenda Vassoural the percentage found infected was 62, with an average of 1,684 eggs per gm. The inhabitants were divided into two groups, those whose dwellings had no latrines of any kind and those in which latrines of a simple and absorbent type [presumably pit latrines] were provided. In the former the average eggs per gm. were for men and women 2,960 and 2,326, and in the latter 1,551 and 980. As to race: in white men the percentage of infection detected was 64·1 of 354 examined and in women 60·8 of 364; the corresponding figures for negroes were 64·2 of 56, and 70·4 of 61. In 51 white men in whom no eggs were detected by the Stoll-Hausheer technique the percentage of haemoglobin was 75·3, in 125 in whom eggs were less than 5,000 to the gram it was 73·3, and in 25 in whom eggs were 5,000 or over, 67·4; the corresponding figures for negroes were: in 16, 75·7; in 12, 75·6; and in 1, 55 per cent.; there was then no direct relationship between detected egg numbers and the percentage of haemoglobin.

V. To the Stoll-Hausheer diagnostic technique there were percentage decreases in necator egg numbers (after tetrachlorethylene given in an adult dose of 3 cc.) varying from 46 to 49 after one treatment and from 78 to 84 after two. It is well to note that after 2 cc. of this drug the number of Ascaris eggs was *increased* by 9 per cent. Figures are given for other treatments. *C. L.*

Scott (R. Bodley). **The Iron-Deficiency Anaemias.**—*Lancet.* 1938. Sept. 3. pp. 549–552.

Under "Overt blood loss" come these words: "In a world-wide census the commonest cause would probably be blood loss due to infestation by the hookworm."

[There runs through hookworm literature surprise, expressed or implied, that anaemia and the weight of hookworm infection do not run parallel. The following sentences from this paper put the matter with admirable clarity, for it is not the number of hookworms that determine the onset and degree of hookworm anaemia, but the host's iron reserve.]

"The total amount of iron in a healthy adult is between three and four grammes and it exists in three main forms. First, the iron of the circulating haemoglobin which has an average total of 2·3 g.; secondly, iron stored in the liver, bone-marrow, and spleen which is available for conversion into haemoglobin should need arise. Clinical experience shows that a healthy man may reduce his haemoglobin to 50 per cent. and subsequently repair the anaemia without administration of iron; so it may be taken that the available iron stores are equivalent to about half the haemoglobin-iron or 1·15 g. Thirdly, a small amount exists in the tissues in an unavailable form."

"Overt blood loss will rapidly lead to a state of iron deficiency. It is recognised that an adult may lose about half his total blood volume and yet mend the consequent anaemia completely without the administration of iron; but this may only happen once, for the repair of the anaemia will have exhausted the whole of the available iron store in the body and thereafter every milligramme of haemoglobin lost is haemoglobin which cannot be replaced until the patient be given more iron. Once the iron reserve has been depleted in this way anaemia will develop rapidly from

what may seem trivial loss of blood and will persist after the haemorrhage has stopped because the raw material for manufacture of haemoglobin is lacking." *C. L.*

CASTILLO ODENA (Isidro). Papel que desempeña la escuela en la profilaxis de la anquilostomiasis en la República Argentina. [**Schools in the Prevention of Ankylostomiasis in the Argentine.**]—*Bol. Sanitario.* Buenos Aires. 1938. Feb. Vol. 2. No. 2. pp. 136–144. With 2 graphs.

The fourth South American Conference on Hygiene, Microbiology and Pathological Anatomy, held in 1926, urged the importance in any antihookworm campaign of treating children while attending school.

In 1935, 1936 and 1937 treatment was given to children in 269, 296 and 356 schools respectively; in all 30,708 treatments of which 27,073 were first ones. Of 13,622 children who went barefoot the percentage of detected infection (the technique seems nowhere to be stated) was 49·6; of 12,254 whose homes were without latrines it was 59·4. Tallquist and faecal examinations were made in about 10 per cent. of those reported on. The toxicity of anthelmintics and the value of iron are noted. *C. L.*

AKETAGAWA (Hiroshi). **Some Experimental Contributions on Oral and Cutaneous Infection of Hookworms.**—*Japanese Jl. Experim. Med.* 1938. June 20. Vol. 16. No. 2. pp. 85–107. With 5 charts & 6 figs. on 1 plate. [11 refs.]

It is concluded that infective canine hookworm larvae, when swallowed, penetrate the wall of the alimentary canal and do not remain in its lumen.

A casual reference found in the paper shows that the author was dealing with the infective larvae of *Ancylostoma caninum.* From 72 to 96 hours after an infective feed there were collected from the bodies of pups about half the number of larvae which the feed had contained, but if examination were delayed for 10 days 98 per cent. of these larvae were accounted for. In adolescent dogs the position was reversed—40 per cent. being collected at the earlier and 32 at the later time. In old dogs this change was exaggerated, 24 per cent. after 72 hours and 3·7 later. In a pregnant bitch, the young were infected, nearly all larvae being in their lungs, the quantity being described as "up to nearly 30 per cent. of the number of larvae found in the mother's intestine." *C. L.*

v. BRAND (Th.) & OTTO (G. F.). **Some Aspects of the Carbohydrate Metabolism of the Hookworm,** *Ancylostoma caninum,* **and its Host.**—*Amer. Jl. Hyg.* 1938. May. Vol. 27. No. 3. pp. 683–689. [18 refs.]

"The total glycogen found in the dog hookworm (*A. caninum*) during these studies was much less than that so far reported for other intestinal helminths. Furthermore, the total glycogen content of the worms was unchanged by short periods of starvation or alimentary hyperglycemia of the host. These facts may be related to the extraordinary blood-sucking habits of these worms which conceivably permits an oxidative type of metabolism and further insures a more or less continuous food supply

without the necessity of storing nutrient material. The severe but sub-lethal hookworm infections of a month's duration had no apparent effect upon the carbohydrate metabolism of the host." *C. L.*

i. KHALIL (M.). **The Site of the Adult Filaria in the Human Body is the Determining Factor in the Microfilaria being Periodic or Non-Periodic even in the Same Species.**—*Jl. Egyptian Med. Assoc.* 1938. Aug. Vol. 21. No. 8. pp. 502–505.

ii. ——. **Microfilariae disappear into the Lymphatics when absent in the Peripheral Blood.**—*Ibid.* Sept. No. 9. pp. 595–596.

iii. ——. **Thermotropism in Filariasis : the Basis of the Clinical and Pathological Manifestations and the Rational Methods of Treatment.**—*Ibid.* pp. 597–602.

i. The title shows the scope of the paper. It refers to *Wuchereria bancrofti*.

In the South Pacific Islands the intermediate host is *Aëdes*, a day biter mostly of the upper extremities, the adults grow up in the corresponding lymph vessels, their microfilariae pour directly into the veins of the neck or the terminal portion of the thoracic duct, and they show no periodicity in the blood. Elsewhere the intermediate host is *Culex* which bites the lower limbs, especially in the evening before bedtime, the adults grow up in the corresponding lymphatics and their young pass into the thoracic duct. The author adds that the adult *Wuchereria bancrofti* generally inhabits the lower parts of the body in most countries, but in the South Pacific Islands a third to three-quarters of the worms inhabit the upper extremities. "This is borne out by the fact that in Fiji Manson-Bahr extracted adult worms from six cases, of whom three had worms in the upper limb." A second factor in causing periodicity is the lymph flow—in this way: In the daytime man's position is mainly upright and gravity keeps in the lower part of the thoracic duct and in its tributaries the microfilariae from the lower limbs; when he lies down at night this attitude, coupled with the maximum flow of chyle, which it is said takes place 12 to 13 hours after a meal, is held to bring them into the blood about midnight.

This note seems hasty, for 17 per cent. of it has been rewritten as a corrigendum. Doubtless in the more extensive paper promised, controls will be published and the results of infections of the male genitalia considered, for in both types of infection the lymphatics from these open into the thoracic duct. The statement regarding BAHR's work (1912) (*Jl. London School Trop. Med.*, 1911–12, Vol. 1, Supp. No. 1) is incomplete and refers to his Appendix V only, for his Appendix XXIV shows that he found dead or living adult worms in all of six enlarged epitrochlear glands and in ten of eleven enlarged groin glands, it being said of the eleventh "the gland had been preserved in formalin thus making dissection a difficult task." In these non-periodic cases, then, the habitats of adult worms showed no perceptible discrimination in favour of the arm. BUXTON's work (1928) [this *Bulletin*, 1929, Vol. 26, p. 436] in the South Pacific is apposite, for it covered both types of infection; symptoms referable to worm infections of the male genitalia were noted in 40 per cent. of 1,103 persons examined in Samoa where infection is non-periodic and in 30 per cent. of 318 persons in the New Hebrides, where it is periodic (Table 23). As to enlarged lymph nodes, to whose relationship with

the presence of worms BAHR's quoted work testifies, BUXTON in the cited table reported, for the non-periodic Samoan infection, enlarged inguinal nodes in 45·8 per cent. and enlarged epitrochlear nodes in 47·6 per cent., while the corresponding figures for the periodic New Hebrides infection were 26·1 and 17·3. The locality of enlarged and presumably infected nodes had then no obvious relationship to the type of infection.]

ii. "Such a migration from the capillaries into the lymphatics was proved by experiment in [the sheathless] *Microfilaria immitis* of dog (Augustine and Drinker, 1935)."

This paper corrects two statements made in the earlier papers of his series. The first is a further addition to the long corrigendum in (i) as to the flow of chyle after food.

"In consulting the original paper of Munk and Rosenstein, I found that this figure refers to the flow in 12 hours after food."

It was mentioned in the last paragraph in the article referred to that "all microfilariae in man live for a few hours" while it is meant "a few days." [The original corrigendum had altered this to "for a limited time."] Then there is the *ex cathedra* statement regarding migration from blood capillaries into the lymphatics.

"In these repeated journeys through the lymphatic system, the microfilariae pass into the blood circulation at a time determined by the lymph flow and posture in man. On the whole this tends to accentuate nocturnal periodicity as the thoracic duct drains the major part of the body."

iii. A series of statements held to support the hypothesis found in the title.

ROMITI reports that from excised tissue containing adult Wuchereria the worms come out into "warm" saline if the lymphatics are patent. The spermatic cord region is the warmest in the body, its lymphatics are the first in which valves lose their functions, so there is direct communication between them and the pelvic and abdominal lymphatics and the worms migrate back and forth between them and the genitalia while most patients suffer no symptoms. But if too many worms get into and partly block a vessel, it dilates into a lymphatic cyst, this bursts or leaks internally and causes filarial lymphangitis and is the basis of the allergic filarial skin reaction. "This explains all the known facts of Filariasis," namely the common occurrence of *W. bancrofti* in the lymphatics of the spermatic cord and epididymis, an absolute relief from periodic lymphangitis and elephantoid fever by removal to a cold climate, the periodicity of the lymphangitic attacks seeing that the hole in the lymphatic closes and the cycle is repeated again at practically equal intervals and the attacks have a severity proportionate to the amount of fluid which escapes. A cold application chases the worms away if the passage for escape is clear, if not it depresses their fecundity.

"Filarial lymphangitis, elephantoid fever, Calabar swellings, the various skin manifestations in *Onchocerciasis* and *A. perstans* infection are different grades of the same phenomenon . . . Bacteria may come in as a secondary infection or they may precipitate an attack by providing a focus of a high temperature attracting the adult filariae to it . . . The reported value of vaccine therapy is understood not as due to a specific *Streptococcus* but any kind of vaccine will have a similar effect. Adrenaline will be useful."

[The promised definitive report will presumably aim at justifying these *ex cathedra* statements.] *C. L.*

GALLIARD (Henri). L'auto-infestation au cours de la strongyloidose humaine. [**Autoinfection by Strongyloides in Man.**]—*C. R. Soc. Biol.* 1938. Vol. 128. No. 20. pp. 572–574.

The conclusion that autoinfection by Strongyloides is common is a hasty one and the statement that any delay of over a few hours during passage through the intestine implies formation of infective larvae is contrary to fact.

Three fatal cases of infection are noted. Of one it is merely said that filariform larvae were present in large numbers in fresh stools so that, if they had been formed in the intestine, they could have pierced the wall. In a second, who was in a state of extreme cachexia, many rhabditiform larvae had been present in the stool two days earlier ; at autopsy, the interval between which and death is unstated, there were females and eggs in the lumen of the glandular crypts of the mucosa with no sign of penetration in numerous ulcers ; in the lumen of the bowel were many active rhabditiform larvae, and a very few degenerate filariform larvae. In a third there were no Strongyloides larvae but many rhabditiform ones on the surface of epithelium and of an ulcer, but these seemed to have no tendency to penetrate. Cachexia and approaching death will favour formation of filariform larvae. *C. L.*

RAMOS E SILVA (J.). Sobre o tratamento da " larva migrans." [**The Treatment of Larva Migrans.**]—*Hospital.* 1938. Sept. Vol. 14. No. 3. pp. 465–468. With 1 fig.

For creeping eruption the local treatment advised is an anthelmintic dressing consisting of oil of chenopodium 50 drops, essence of wintergreen 5 grams, gomenol 10 per cent. [? in olive oil] 50 grams. It soothes the irritation, quietens secondary inflammation and immobilizes the larva. The objection to freezing is that the larva may be beyond the visible tunnel. The other treatments and the kind of larva which may cause the lesion are noted. *C. L.*

GALLIARD (Henri). A propos de *Rhabditis hominis* Kobayashi 1914.—*Rev. Méd. Française d'Extrême-Orient.* 1938. Apr. Vol. 17. No. 4. pp. 381–383.

JONES (Myrna). **The Diagnosis of Pinworm Infestation.**—*Rev. Med. Trop. y Parasit.* Habana. 1938. May–June. Vol. 4. No. 3. pp. 147–149.

The Cellophane NIH swab [see HALL, this *Bulletin*, 1937, Vol. 34, p. 878] is described and considered by a member of the U.S. Public Health Service. The following are clear instructions for its use :—

" The cellophane covered tip of the glass rod is used much as a cotton swab might be used, with outward strokes along the anal folds and about the anus ; the folded edges of the cellophane pick up sticky debris and eggs, or even worms when present. The swab is not inserted into the rectum. A considerable surface should be covered since the worms may migrate some distance before eggs are deposited. The cellophane may be removed from the swab and examined microscopically immediately after use or several days later with equally good results." *C. L.*

REARDON (Lucy). **Studies on Oxyuriasis. X. Artifacts in " Cellophane " simulating Pinworm Ova.**—*Amer. Jl. Trop. Med.* 1938. July. Vol. 18. No. 4. pp. 427–431. With 2 plates.

" Artifacts which simulate ova of *Enterobius* are frequently found in the ' Cellophane ' of the NIH swab, described by Hall (1937) [see this *Bulletin*,

1937, Vol. 34, p. 878], used in diagnosis of pinworm infection. Attention is called to these artifacts in order to avoid possible confusion of them with pinworm ova. These artifacts are not superficial but are imbedded in the cellulose film and cannot be dislodged by surface scratching. They consist of a definite hyaline outline, usually ovoid, sometimes rounded, enveloping a dark, amorphous mass, the whole structure markedly similar to a pinworm egg. The hyaline outline, which appears to be composed of several layers, resembles the transparent shell layers of the egg of *Enterobius*. The central mass is irregular, brownish or greenish, with usually a clear space between it and the hyaline outline. Size variation is great but usually falls within the range of the pinworm egg, so that size and appearance constitute a potential source of error in diagnosis of oxyuriasis."

C. L.

REARDON (Lucy). **Studies on Oxyuriasis. XVI. The Number of Eggs produced by the Pinworm,** *Enterobius vermicularis*, **and its Bearing on Infection.**—*Public Health Rep.* 1938. June 17. Vol. 53. No. 24. pp. 978–984. With 2 figs. [14 refs.]

"Counts, made by rather precise techniques, of the eggs present in 20 gravid females of *Enterobius vermicularis* show from 4,672 to 16,888 eggs per worm. The arithmetical mean is 11,105, and the mean of the extremes is 10,780. These figures, in connection with studies on the recovery of pinworm eggs from households, afford some explanation of the familial nature of oxyuriasis, and the status of pinworms as the most common of all the pathogenic worm parasites of man." *C. L.*

MARSHALL (George R.) & WOOD (Q. L.). **Ischioanal Abscess caused by** *Oxyuris vermicularis.*—*Northwest Med.* 1938. June. Vol. 37. No. 6. pp. 180–182. With 2 figs. [18 refs.]

A boy kicked in the anal region developed a right ischioanal abscess which burst externally, closed, had to be reopened and which, it was later discovered, was also in communication with the rectum. On reopening it was found to contain many threadworms and their ova. [That the threadworms may well have got into the abscess through the opening (at first undetected) by which it burst into the rectum, and were not the cause of the abscess, is not considered.] *C. L.*

WRIGHT (Willard H.) & BRADY (Frederic J.). **The Treatment of Oxyuriasis.**—*Rev. Med. Trop. y Parasit.* Habana. 1938. May–June. Vol. 4. No. 3. pp. 151–153.

As controlled by the NIH swab, gentian violet is apparently highly efficient in treating threadworms and it has many advantages.

Of 163 patients completely treated, over 90 per cent. have become negative. The course advised is two periods of eight days with an interval of seven days. The dose for adults is two "enteric-coated" tablets [this term is not explained] each containing half a grain of gentian violet given three times a day before meals; for those under 15 years it is 1 centigramme a day for each year of *apparent* age. Of the patients, 103 showed no reaction, there was nausea in 24, vomiting in 23, diarrhoea in 17, griping in 15, constipation or dizziness each in 2, headache in 1. The course is relatively cheap and is easy to give, an important point when many in a household have to receive treatment. *C. L.*

MALARIA.

Précis of Abstracts in this Section.

Park (p. 331) discusses the general policies necessary for the control of malaria and the need for the co-operation of all departments. Breuil and Mollaret (p. 331) have produced a monograph on the prevention of malaria.

Moreau (p. 332) uses a watery emulsion of pyrethrins for house spraying. One litre for each 200 cubic metres of space was enough to secure the absence of mosquitoes for 24 hours. He advises as to how this method should be employed.

Wassilieff (p. 332) shows the necessity of paying attention to temporary breeding places in Tunis, to which larvae may be carried by floods, as well as to permanent breeding places. He advises as to the use of *Gambusia* and the attack on adult *Anopheles*. Collignon (p. 333) describes the draining of a lake in Algiers by means of a tunnel through hills. DeBusk (p. 333) states that in America, improper impoundment of water has been known to bring a return of malaria to places previously free for years. He discusses the measures necessary to prevent breeding. Hinman (p. 334) shows that in reservoirs in Alabama the weekly alteration of the water level causes the death of much of the vegetation and facilitates the cleaning of the edges with great reduction of breeding. Ejercito (p. 335) describes anti-larval measures on an estate in the Philippines. Tilli (p. 335) advocates the use of calcium cyanamide for the treatment of barrage-reservoirs. It is a powerful larvicide and a useful fertilizer.

Ambialet (p. 335) found that Williamson's herbage cover method was unsuitable for the prevention of the breeding of *A. maculipennis* in Algeria.

Blacklock (p. 336) describes a device for the oiling of the water in the cisterns of water closets.

Roy (p. 336) considers that sporozoites in emulsion tend to adhere to glass utensils, and that the counting of dilutions may be unreliable. An emulsion leaving a syringe may contain considerably smaller numbers than the estimated dose.

Hewitt (p. 336) describes a medium for the cultivation of *P. cathemerium*. Herman (p. 337) details mosquitoes capable of transmitting *P. circumflexum* and *P. cathemerium*.

Kikuth and Mudrow (p. 337) consider that E-forms play a definite rôle in the malaria cycle of birds. They are host-specific and are found in the endothelial cells of internal organs. Reasons why they are not regarded as belonging to the toxoplasma group are given. Hegner and Eskridge (p. 338) recognize five categories of avian red cells. Merozoites usually enter the young cells of the second and third categories.

Young (p. 338) found in birds pathological evidence which reflected the less intense immunity reaction produced by *P. rouxi* as compared with that produced by *P. cathemerium*. Resistance to superinfection is correlated with the degree of phagocytosis during the acute phases of infection. James and Tate (p. 339) found that exo-erythrocytic schizonts of *P. gallinaceum* appeared in the brain and other organs only after the intra-erythrocytic forms had occurred. They describe the appearances. The extra-erythrocytic schizonts may be found in

birds apparently cured of peripheral infection by quinine. CHORINE (p. 340) found a progressive increase of blood proteins in fowls infected with *P. gallinaceum*. This is chiefly due to increase in globulins.

CHRISTOPHERS and FULTON (p. 340) describe *P. knowlesi* infection in monkeys. This is invariably fatal if not treated and if treated leads to relapses followed by chronic infection. The average incubation period is 5·6 days and the average time of death 10·6 days. Gametocytes are seen and haemoglobinuria may occur. Atebrin and undecane diamidine are useful remedies. *C. W.*

CHINESE MEDICAL JOURNAL. 1938. July. Vol. 54. No. 1. pp. 51–56.—**Malaria.**

This is a paper communicated by Dr. PARK, the Director of the Far Eastern Bureau of the Health Organisation of the League of Nations at Singapore. It embodies the recommendations made by the Rural Hygiene Conference, that was convened by the League of Nations in Java in August 1937, on the subject of malaria control. The recommendations are obviously of a general character: they could hardly be otherwise, given the great diversity of conditions prevailing in the Far East. Stress is laid on the outstanding importance of malaria as a public health problem. The need for all administrations having at their disposal technical staff adequately trained in malaria work, and the value of practical demonstrations of malaria control, as a means of arousing the interest of administrators, are emphasized. The need for close co-operation between the Health and other Government Departments in antimalarial work is underlined. Due regard is paid to the fact that financial considerations provide too often an insurmountable obstacle to malaria control in rural communities. This leads naturally to a consideration of naturalistic methods of control and the need for further research along these lines. Man-made malaria is dealt with, reference being made to the part played by the engineer and the peasant himself in providing additional breeding places for anophelines. The imperative duty of administrations to place quinine or other cinchona preparations within the reach of all malaria-stricken populations is mentioned, and ways and means are briefly discussed. The Conference paid a fitting tribute to the value of the international course in malariology held each year in Singapore under the auspices of the Health Organisation of the League of Nations and recommended a concurrent course for anti-malaria engineers. *Norman White.*

BREUIL & MOLLARET. La prophylaxie du paludisme. Mise au point d'après quelques données récentes. [**The Prevention of Malaria.**]—*Arch. Méd. et Pharm. Nav.* 1937. Oct.–Nov.–Dec. Vol. 127. No. 4. pp. 665–710. [37 refs.]

The authors of this little monograph on the prevention of malaria disclaim at the outset any intention of producing an original work: their sole ambition was to produce something that might be of use to naval medical officers with little or no practical experience of the disease. They have succeeded in their self-allotted task and have produced a *vade-mecum* which, considering its brevity, is remarkably complete. The account given is based on a study of malaria research and prevention in French Indo-China. *N. W.*

MOREAU (P.). Valeur des pulvérisations insecticides dans la lutte antimalarienne. [**Value of Insecticidal Sprays as an Anti-Malarial Measure.**]—*Rev. Méd. Française d'Extrême-Orient.* 1938. Mar. Vol. 16. No. 3. pp. 264–274. With 2 figs.

The author gives a résumé of recent work on insecticidal sprays for the destruction of adult anophelines in dwellings and pays special attention to the work of Park Ross [this *Bulletin*, 1937, Vol. 34, pp. 59–60] in Natal, which he visited. He describes experiments carried out in the laboratory and in the suburbs of Hué, Annam. As there are local grave disadvantages in the use of an inflammable solvent for pyrethrum preparations the author made use of a watery emulsion of pyrethrins prepared by a French firm. It is put up as a concentrated extract in tins: its pyrethrin content is 5·5 per cent. Diluted with water it forms a stable, homogeneous suspension that is easy to spray. As pointed out by SINTON and WATS [this *Bulletin*, 1936, Vol. 33, p. 255] better results are obtained with high temperature and low humidity. A daily spraying, about 5 p.m., with a 1 per cent. dilution of the concentrated product enabled one to pass the night, after the second day, in a treated house without being bitten. Whereas before treatment two persons were able to catch upwards of 100 mosquitoes in this house, in an hour, daily attempts at catching mosquitoes after the third day of treatment were invariably negative. The native house in question had the door and its three windows open the greater part of the day, and there was an air space between walls and roof. In spite of these conditions one litre of the diluted insecticide for each 200 cubic metres of space was sufficient to secure the absence of mosquitoes for 24 hours.

The spraying apparatus used was Geneste and Herscher's disinfectant spray such as is used in large hospitals for formalin spraying etc. The container holds ten litres. The jet is powerful and diffusion perfect.

The author concludes that such a method should be used if and when it is necessary to break temporary contact between a community and a hyperinfecting domestic anopheline fauna. Thus it could be used to cut short a localized epidemic or to protect a camp in an epidemic area. It does not replace, but is a valuable addition to, classic methods of prophylaxis. *N. W.*

WASSILIEFF (A.). La lutte antilarvaire, en Tunisie, doit-elle être saisonnière ou continue? [**Ought Antilarval Measures in Tunis to be Seasonal or Continuous?**]—*Arch. Inst. Pasteur de Tunis.* 1938. Mar. Vol. 27. No. 1. pp. 31–41.

In Tunis *Anopheles* breed the whole year through. Anti-larval measures must therefore be carried on without intermission but the nature of these measures should be modified from time to time as determined by biological observations carried out in each locality. For example, floods following heavy rains clear the *oueds* or water-courses of larvae. These larvae may be carried far afield to where temporary breeding places are formed in ditches, ravines or any low-lying ground. These temporary breeding places then call for the attention that was previously given to the water-course. Photographs taken from an aeroplane have been of value by indicating all collections of water left by floods that need attention. There are

also permanent breeding places, especially in the oases. Here antilarval measures, if persistently carried out, should be most successful: the breeding places in many cases are not numerous and the nearest outside breeding places may be tens or hundreds of kilometres away. *Gambusia* have been of the greatest value. To obtain the best results with *Gambusia* it is necessary to keep the water free from too dense an algal growth and to remove other obstacles, such as dead rushes, which may prevent the fish from obtaining access to larvae. During floods when no larvae are found in water-courses adult anophelines may be found in unusual numbers in houses bordering the streams. An attack on adult *Anopheles* in these conditions may be productive of good as indeed at other times.

N. W.

COLLIGNON (E.). Une grande mesure antilarvaire: l'asséchement du lac Halloula. [**A Major Antilarval Work: the Draining of Lake Halloula.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. June. Vol. 16. No. 2. pp. 166–175. With 4 figs. on 2 plates & 2 text figs.

Sixty-two kilometres west of Algiers is a small village, Montebello, three kilometres from the sea from which it is separated by a range of hills. Montebello has a population of 169 and has had an unenviable reputation for malaria. Lake Halloula close to the village afforded plentiful and inaccessible breeding grounds for anophelines. The lake has been drained by means of a tunnel through the hills with the result that the spleen index which was 60 in 1932 had been reduced to 7 in the corresponding period of 1937. The canal began to function in the spring of 1935. During the progress of the work large labour forces caused a temporary increased prevalence of the disease. *N. W.*

DEBUSK (C. K.). **Water Conservation: a New Problem in Malarial Control.**—*Texas State Jl. of Med.* 1938. Apr. Vol. 33. No. 12. pp. 826–828. [Summary taken from *Public Health Engineering Abstr.* Washington. 1938. Nov. 5. Vol. 18. Signed Fred G. KALLMEYER.]

Pioneers in Texas, through necessity, conserved water in rain barrels for themselves and in stagnant ponds for their live stock, and thus created additional breeding places for mosquito millions.

There is a justifiable apprehension on the part of some that this is about to be repeated on a large scale, due to the great water conservation program throughout Texas. Projects under construction and contemplated will create about thirty-five major reservoirs, with possibly thousands on the tributary streams. Backing the water up and spreading it out into the lowlands along the river valleys, may lead to an acute problem in the matter of malaria control, threatening to destroy the results of so much time and energy which have been devoted to the task of eliminating mosquitoes and their breeding places. Improper impoundment of water has been known to bring a return of malaria to sections that for years have been free of the disease.

There is a serious need for the conservation of water for beneficial uses, including irrigation, and to protect the health of the people by

preventing through proper conservation methods the pollution of these waters to an extent that will render them unfit for human uses. The conservation of surface waters is of extreme importance also from the standpoint of the underground supply. In all sections of our State there has been a serious recession of the water level and in many sections of the State it has fallen as much as 150 feet.

If the necessary antimalarial measures are taken, there should be no danger of increasing the extent of malaria or introducing it into new areas. Dams should have gates and flash boards to permit lowering of water levels at the proper time. The basin should be cleared of all trees and brush should be piled and burned to prevent the flotage later. Trees and brush should be cut back a sufficient distance from the high water contour to permit inspection and to prevent these growths along the shallow water edges from holding flotage. It is recommended that the water level be maintained at this maximum elevation during the winter and early spring in order that the edges of the reservoirs may be flooded to prevent the early growth of land vegetation ; then later on in the summer the water level should be lowered quickly to strand flotage and larvae in the shallow areas, and wave action in the deeper portions of the lake should prevent anopheline breeding. Larvicides of various chemical content, oil, kerosene or other sprays, can be used in special locations. Gambusia, commonly known as " top minnows," are very helpful.

In East Texas the contemplated region-wide program will eliminate a large portion of the swamp areas where water now stands for long periods and creates ideal mosquito-breeding conditions. It is intended to make mosquito control an integral part of the Sabine-Neches conservation district program and to embody preventive measures in the plans, construction and maintenance of the project.

(Discussion, Dr. Henry Tucker) : I am very hopeful that a plan of impounding the spring floods in large reservoirs of rippling sun-reached water, whose level can be controlled and where it can be released through proper channels to prevent the accumulation of dead and stagnant surface and back water, will produce a permanent condition similar to that which now exists only in the driest months, and prove to be a big forward step in malaria control in East Texas.

HINMAN (E. Harold). **Biological Effects of Fluctuation of Water Level on Anopheline Breeding.**—*Amer. Jl. Trop. Med.* 1938. Sept. Vol. 18. No. 5. pp. 483–495. With 5 figs. & 2 graphs.

In reservoirs in Alabama *Anopheles quadrimaculatus* breeds in great numbers if there is much dead floating material or much growth of vegetation in the shallow water round the edge. If the level of the water is caused to fluctuate once a week much of the vegetation is killed, and some of the floating material is stranded, so that the shore line becomes nearly clean, and breeding places are much reduced. The intention is mainly to render much breeding of *Anopheles* impossible ; it is not claimed that if breeding is going on many of the larvae can be killed. Artificial raising and lowering of water level should, therefore, be undertaken in spring before the insects multiply.

It seems that no catching stations were in use, and no measure is given of the reduction in mosquitoes which resulted from what was done. *P. A. Buxton.*

EJERCITO (Antonio). **Biological Control of *Anopheles funestus minimus* Subgroup breeding in the Philippines, I: A Critical Study on Biological Control of *A. minimus* var. *flavirostris* as an Anti-Malaria Measure at the Hacienda Tala, San Jose del Monte, Bulacan.**—*Jl. Philippine Islands Med. Assoc.* 1938. July. Vol. 18. No. 7. pp. 415–435. With 1 map & 1 folding graph.

This is an account of the control measures undertaken in a hacienda in which extensive breeding of *A. flavirostris* in numerous streams was responsible for high malaria incidence among a floating population. The "biological" control measures consisted of clearing, or sun exposure, of breeding places; construction of a series of dams to cause stagnation of the water; sloping of stream banks with straightening of edges at water level, and channelling. The work was begun in January 1935 and continued to the end of 1936 when the Hacienda Tala had to cease operations owing to lack of financial support. In the meantime there was decreased anopheline breeding, decreased adult anopheline prevalence, and decreased malaria incidence, results which the author attributes to the measures undertaken, incomplete though they were. He endeavours to justify this conclusion at very great length. *N. W.*

TILLI (Pietro). Le moderne tecniche agricole impongono l'estensione della disanofelizzazione con calciocianamide. [**Use of Calcium Cyanamide to combat Anophelines.**]—*Riv. di Malariologia.* Sez. I. 1938. Vol. 17. No. 3. pp. 225–230. With 3 figs. French summary (8 lines).

This is a discussion of an American agricultural method of treating arid soils by the construction of "barrage-reservoirs." Deep parallel trenches are dug to capture and retain the rain. In malarial countries this may provide facilities for anopheline breeding. To combat this danger the author advocates the use of calcium cyanamide, a powerful larvicide and a useful fertilizer. *N. W.*

AMBIALET (R.). Sur un essai de destruction de gites à larves d'anophèles par la méthode de Williamson (herbage cover). [**Attempted Destruction of Anopheles Breeding by Herbage Cover.**]—*Arch. Inst. Pasteur d'Algérie.* 1938. June. Vol. 16. No. 2. pp. 161–165. With 2 figs. on 1 plate.

This is a description of an attempt at eliminating the breeding of *A. maculipennis* in a water-course close to a village in the Department of Constantine, Algeria, by WILLIAMSON's Herbage Cover Method [this *Bulletin*, 1935, Vol. 32, pp. 429–430]. In this village the malaria season is from June to November at which period the water-course is a streamlet linking up a series of pools. At the end of April two kilometres of this water-course were treated as recommended by Williamson. The author's experience indicates that the method does not lend itself to a wide application in Algeria. There was certainly a disappearance of anopheline breeding coinciding with the period of fermentation of the herbage cover: this was of limited duration, however, less than two months. Subsequently there was a recrudescence of anopheline breeding. The disadvantages, a nauseating stench and an abundance of culicines, are certainly not negligible for dwellers in the vicinity. *N. W.*

BLACKLOCK (D. B.). **A Device for applying Oil or Other Liquids to Flushing Cisterns.**—*Ann. Trop. Med. & Parasit.* 1938. Aug. 2. Vol. 32. No. 2. pp. 109–114. With 3 figs. [Summary appears also in *Bulletin of Hygiene.*]

Although the introduction of piped water supplies and water carriage sewerage in the tropics offers a most important means of eliminating various diseases which depend upon human excreta for their propagation it is attended with the risk of mosquito breeding in the flushing cisterns for water closets, urinals and slop sinks. This paper describes various attempts which have been made to mosquito-proof these water cisterns and describes what is claimed to be a very effective device for discharging the necessary quantity of an oil on to the surface of the water in the cistern as soon as the " flush " of the cistern has taken place. The oil used consists of 88 parts of fuel oil, 10 parts of kerosene and 2 parts of castor oil and the charge amounts to 15 drops of this mixture at each pull of the chain.

The apparatus has been tested with anopheline and culicine larvae and has proved effective in killing them. *H. T. Calvert.*

HILL (Rolla B.). Método de profilaxia anti-sezonática em Portugal. Conferência realizada no Instituto Rocha Cabral em Maio de 1938. [**Anti-Malarial Measures in Portugal.**]—30 pp. 1938. Lisbon. Imprensa Lucas & Ca.

ROY (D. N.). **A Note on Shute's Technique of enumerating Sporozoites in an Emulsion of Salivary Glands.**—*Jl. Malaria Inst. of India.* 1938. Sept. Vol. 1. No. 3. pp. 335–337.

The author's experience with Shute's method of counting sporozoites in emulsions of salivary glands has not been satisfactory. Having determined the sporozoite content of the emulsion by counting in a Thoma-Zeiss counting chamber, dilutions were made with sterile salt solution. The number of sporozoites in the dilutions bore no proportionate relationship to each other nor to the sporozoite content of the original emulsion. Similar discordant results were obtained with sporozoites killed with formalin, made up to a 1 per cent. formalin emulsion and diluted to various strengths. The author's explanation of these results is that the sporozoites have a tendency to adhere to the inner surface of the glass utensil used. The result is that an emulsion leaving a syringe may contain a considerably smaller number of sporozoites than the estimated dose. *N. W.*

HEWITT (Redginal). **The Cultivation of *Plasmodium cathemerium* for One Asexual Generation on Inspissated Egg and Rabbit Serum.**—*Amer. Jl. Hyg.* 1938. Mar. Vol. 27. No. 2. pp. 341–344.

The author has introduced into a medium consisting of inspissated whole egg slants covered with 10 cc. of 0·9 per cent. saline containing 0·5 per cent. dextrose and serum of a bird or rabbit, blood from a bird with a heavy infection of *Plasmodium cathemerium* and has noted that if incubated at 37°C. the young intracorpuscular parasites grow into fully formed schizonts, though less rapidly than they do in the blood of control birds. The merozoites formed do not appear to leave the host cells in the culture tubes. *C. M. Wenyon.*

HERMAN (Carlton M.). **Mosquito Transmission of Avian Malaria Parasites** (*Plasmodium circumflexum* **and** *P. cathemerium*).—*Amer. Jl. Hyg.* 1938. Mar. Vol. 27. No. 2. pp. 345–350.

The author has tested the transmitting powers of a number of mosquitoes (*Culex pipiens, C. apicalis, Aëdes sollicitans, A. canadensis, A. cantator, A. vexans* and *Theobaldia melaneura*) with *Plasmodium circumflexum* and *P. cathemerium* of birds. Of the mosquitoes the last named successfully transmitted *P. circumflexum* while *P. cathemerium* was transmitted by *C. pipiens* and *A. sollicitans*. From the differences in susceptibility of *A. sollicitans* to different races of *P. cathemerium* it seems that one or more varieties may be included under the one name. *C. M. W.*

KIKUTH (Walter) & MUDROW (Lilly). Die endothelialen Stadien der Malariaparasiten in Experiment und Theorie. [**The Endothelial Phases of Malarial Parasites in Experiment and Theory.**]—*Zent. f. Bakt.* I. Abt. Orig. 1938. Aug. 18. Vol. 142. No. 3/4. pp. 113–132. With 15 coloured figs. on 2 plates. [36 refs.]

The authors' results deal mostly with *P. cathemerium* infections in canaries as well as with other bird plasmodia. Following sporozoite infection of these birds, unpigmented forms (E-forms) were found in the endothelium of inner organs and in brain capillaries and their numbers increased with increase of parasites in the blood. These E-forms could be transmitted to fresh birds by inoculation with suitable blood or organ emulsions. The liver and brain were found to be richest in E-forms, but a positive result did not depend on the tissue used (brain, lung, liver, spleen). More positive finds were made the later, up to a point, the inoculation from previously infected birds was made, except where the canary was killed immediately following sporozoite inoculation and its blood used. The mortality amongst the birds was greater and the duration of infection longer in the presence of E-forms. As the blood infection dies out the E-forms become fewer, and may appear in fresh birds inoculated with material negative as regards such forms. The question whether erythrocytic forms can give rise to E-forms or whether a chance E-form gradually acquires greater virulence, has to be considered.

The presence of E-forms with one or more nuclei, following inoculation of canaries with different strains and types of bird plasmodia was substantiated, including those of *Pr. praecox* (*P. relictum*) strains isolated from a crow, greenfinch and magpie. These pigmented forms were similar to those of *P. cathemerium* and were present in the same types of cell, being, however, less numerous and present over a shorter period of time. The *Pr. praecox* strain from a crow could not be passaged in canaries, while a circumflex strain isolated by the first author and passaged by blood inoculation failed to give rise to E-forms.

Canaries inoculated with *P. cathemerium* sporozoites and killed at definite intervals, showed single or multiple nucleated E-forms earliest at the site of injection and similar E-forms in the liver and in monocytes of lung, while pigmented forms were still absent from the blood. Similar findings were made in canaries treated by suitable antimalarial compounds to delay blood infection. Later, the brain contained more E-forms in its capillaries than the liver, and this is

true of *P. gallinaceum* from the start. The unpigmented forms in large monocytes or macrophages of the lung did not suggest degeneration, and often several occurred in the same cell with, in cases, another parasite. The host cell and nucleus were at times enlarged.

The fact that all over the world unpigmented forms were noted accompanying different types of plasmodial infection, suggests that these E-forms did not arise from a mixed infection. While these forms in the different cases are morphologically similar, they differ in time and duration of appearance, as well as in cell habitat and in numbers present. The forms are absent in healthy birds and there is no support for the view that a virus infection may play a part. Controlled infection by insect vectors led to the same view.

The author is of the opinion that these E-forms play a definite rôle in the malaria cycle. The view that they belong to the toxoplasma group is refuted, since the latter group is not specific as regards the host, whereas E-forms are host-specific. Moreover no toxoplasma forms were found in malaria vectors and further their appearance is different from that of E-forms.

The literature is reviewed regarding the early developmental cycle of bird plasmodia and it is noted that early descriptions of pigment-free forms agree with those of the present E-forms, whose nature, habitat, and persistence in different plasmodial infections is recorded. Pigment-free forms have been described as occurring in monkey and human malaria, and those of the latter resemble the forms which are found in bird malaria. The embryology of the various parasites is discussed and also the question of relapses in malaria in relation to E-forms. It is not yet certain whether erythrocytic forms can return to endothelial cells. *J. D. Fulton.*

HEGNER (Robert) & ESKRIDGE (Lydia). **Susceptibility of Young Red Cells to the Merozoites of Avian Plasmodia.**—*Amer. Jl. Hyg.* 1938. Mar. Vol. 27. No. 2. pp. 471–492. With 10 coloured figs. on 1 plate. [38 refs.]

In the study of bird malaria very little attention appears to have been paid to the age of the red cells into which the merozoites penetrate. The author has studied infections of *Plasmodium relictum*, *P. circumflexum* and *P. elongatum* from this point of view in canaries, pigeons and chickens and in a wild red-winged blackbird. As regards age the red corpuscles of the bird are divided into five categories recognizable from the character and shape of the cytoplasm and the nucleus. It is found that in over 90 per cent. of cases the merozoites enter the young cells of the second or third category. The five categories of cells, infected and uninfected, are illustrated in a coloured plate.

C. M. W.

YOUNG (Martin D.). **Comparative Pathology of Infections of *Plasmodium rouxi* in Canaries with Other Malarias of Birds, Monkeys, and Man.**—*Amer. Jl. Trop. Med.* 1938. Jan. Vol. 18. No. 1. pp. 85–99. [12 refs.]

The pathological changes produced in canaries by the mild *Plasmodium rouxi* infections have been compared with those following

the more severe *P. cathemerium* infections in those birds. The severe infection produces a more rapid response on the part of the spleen, liver and bone marrow. Thus there is in the spleen in the case of the severe infection a rapid activation of the lymphoid follicles and lymphocytes and an increase in the mononuclear cells of the red pulp, whereas in *P. rouxi* infection the activation is limited to the mononuclear cells of the red pulp. Similarly there was less immediate activation of the bone marrow and liver in the case of the mild infection. In consequence of the milder response the organs in the case of *P. rouxi* infections remained in a state of hyperplasia for longer periods after the crisis, an indication of the less intense immunity response which was reflected in the inefficient resistance to superinfections. The pathological changes brought about by malarial infections in monkeys and man correspond more closely with those in canaries infected with *P. cathemerium*. It appears that the resistance to superinfection is correlated with the degree of phagocytosis carried out by the macrophages during the acute phases of infection. Where there is a very acute infection there is much phagocytosis and a resulting well developed immunity to superinfection. *C. M. W.*

James (S. P.) & Tate (P.). **Exo-Erythrocytic Schizogony in *Plasmodium gallinaceum* Brumpt, 1935.**—*Parasitology.* 1938. Jan. Vol. 30. No. 1. pp. 128–139. With 18 figs. on 2 plates. [24 refs.]

In this paper the authors describe observations they have carried out on the endothelial schizogony, or what they suggest calling it, the exo-erythrocytic schizogony, of *Plasmodium gallinaceum* of fowls. They have noted that these schizonts are not discoverable in the young chicks infected by mosquito inoculations till intra-erythrocyctic forms are present in the blood. They first make their appearance in the brain and then extend to other organs, the spleen being next in importance to the brain in the number of exo-erythrocytic schizonts it contains. The schizonts appear not only after infection by sporozoites but also after blood inoculations. Observers who have found similar forms in birds infected with *P. relictum* have noted that, as far as present observations go, they occur only after infections due to inoculation of sporozoites. The close resemblance of the exo-erythrocytic schizonts of species of *Plasmodium* to those of species of *Haemoproteus* is emphasized. The size of the schizonts varies considerably and, in consequence, the number of merozoites produced, thirty to fifty-five or more. During growth of the schizont division into a number of cytomeres occurs, the merozoites being formed from the surface of the cytomeres. It is noted that there are two types of schizont, the one staining deeply and possessing little chromatin and the other staining a pale blue with Giemsa and having much chromatin. The number of exo-erythrocytic schizonts in the capillaries of the brain may be so great that the fowls die with symptoms of general paralysis. This may also occur in birds which appear to have been cured of the peripheral infection by quinine treatment.

The paper is illustrated by two excellent plates, while the records of other workers are discussed in the light of the authors' own observations.

C. M. W.

CHORINE (V.). Modification quantitative des protéides sériques au cours de l'infection due au *Plasmodium gallinaceum* chez les poules. [**Quantitative Change in Proteids in** *P. gallinaceum* **Infection of Fowls.**]—*C. R. Soc. Biol.* 1938. Vol. 127. No. 5. pp. 391–393.

During the course of *Plasmodium gallinaceum* infections in fowls the blood shows a progressive increase in total proteids (10 to 40 per cent.) which is due chiefly to an increase in the globulins, though the albumin is also increased in amount. Sometimes the albumin is slightly decreased during the acute phase of the infection. *C. M. W.*

CHRISTOPHERS (S. Rickard) & FULTON (J. D.). **Observations on the Course of** *Plasmodium knowlesi* **Infection in Monkeys** (*Macacus rhesus*), **with Notes on its Treatment by (1) Atebrin and (2) 1 : 11 Normal Undecane Diamidine, together with a Note on the Action of the Latter on Bird Malaria.**—*Ann. Trop. Med. & Parasit.* 1938. Oct. 12. Vol. 32. No. 3. pp. 257–278. [10 refs.]

The authors have recorded a number of observations of interest and practical importance made on 150 monkeys infected with *P. knowlesi* during routine laboratory procedure in maintaining the strain and providing material for experiment. The fatal character of the disease has not altered during six years continuous transmission by blood inoculation. The course of the disease in *Macacus rhesus* monkeys is one with a primary attack of great intensity invariably fatal if not treated, followed in those treated, by relapse-like attacks which may also prove fatal, a state of chronic infection, and a period when parasites are still present in the blood, as well as a further period in which although clinically recovered the animal can still be shown to be infected.

Parasites appear in the blood from 2–10 days after subcutaneous inoculation. For 122 animals the average period was 5·6 days. Survival after the 6th day following appearance of parasites is rare. The average time of death from the date of inoculation was 10·6 days. The periodicity was determined as approximately 24 hours, segmentation almost invariably occurring at 12 noon. Different stages of development of the parasite may be seen microscopically with advancing infection, which takes place in step-like fashion, and is generally accompanied by severe anaemia. In splenectomized animals the increase in numbers is more regular.

Gametocytes are seen in the later stages of the infection, females being more numerous than males. Out of 148 animals only 8 had haemoglobinuria, generally seen late in the attack. Spontaneous disappearance of parasites may occur, apart from the type of treatment, a year or longer after inoculation, but evidence of infection after 533 days was also obtained. This type of infection is valuable in chemotherapeutic studies. Various criteria regarding the efficacy of a drug have been employed such as saving of life in the primary attack, disappearance of parasites and length of aparasitic interval following drug administration, as well as total period of infection and sterilization. Atebrin proved very effective in treatment but relapses were invariable, independent of time of administration and dosage, and the total duration of infection was not influenced by the amount of drug given.

In testing the effect of 1 : 11 normal undecane diamidine it was found that the drug was active in *P. knowlesi* infections. Five out of eleven animals survived the primary attack and four were saved. Its action is slower and less certain than that of atebrin. The young forms of parasite were specially affected. Evidence of kidney and liver damage was seen in sections but no methaemoglobin was found. *In vitro* experiments showed marked inhibition of respiration. The same drug is ineffective against *P. relictum* infections of canaries.

J. D. Fulton.

MISCELLANEOUS.

BARDSWELL (Noel Dean). **Tuberculosis in Cyprus. An Interim Report on its Incidence and Means of Control made under the Auspices of The National Association for the Prevention of Tuberculosis.**—pp. vi+228. With 9 maps (2 folding), 3 graphs, 34 figs. & 1 plan. 1937. London: National Association for the Prevention of Tuberculosis. [Summary appears also in *Bulletin of Hygiene.*]

The purpose of the Mission to which this report refers was to determine by a survey the amount and distribution of tuberculosis in Cyprus and by this means to discover whether any sound basis exists for the statements which had been made as to the unusual prevalence of the disease among the people. The most significant result of the inquiry is that the tuberculosis problem is by no means so menacing as it was considered to be. The disease presents itself in much the same character, intensity and distribution as in similar countries, perhaps even in a less degree. The problem is therefore of manageable proportions.

The author used the percutaneous test of MORO in his investigations on the rate of infection. The tuberculin ointment consisted of equal parts of old tuberculin and lanolin, prepared and sent out fortnightly from Edinburgh. It was considered that the use of the intradermal test would have been unwise in view of the attitude of the Cypriot parents, nervous and apt to withdraw co-operation should any untoward happening occur which could be attributed to the test. The author claims that there is little or no difference between the sensitiveness of the von Pirquet and Moro methods. School-children were tested in this way. Of 8,084 children in villages, 6·5 per cent. were found to be positive; of 1,841 in towns, 8·2 per cent. were positive. In many villages evidence of infection could be definitely associated with a tuberculous person.

Patients who had previously been notified as suffering from tuberculosis were examined, so far as this was possible, in certain towns and villages. In a population of 178,434 there were 386 cases on the live register. On investigation, 91 were found to have died, the diagnosis was confirmed in 106 and was not confirmed in 18. The remainder were not seen. Twelve further cases, not notified, were found. A report by Dr. BEVAN shows that of 173 notified cases in the Larnaca District, 98 were dead, the diagnosis in 21 was confirmed and in 10 was not confirmed on examination and the rest were not seen. It is estimated that in this district there are about 0·8 cases of tuberculosis per 1,000, and in Larnaca town about 1·5 per 1,000.

Many of the patients presented signs of chronic pulmonary tuberculosis of the fibroid type and cases of acute disease were not common.

The living conditions of the Cypriots are poor, their houses dark and ill-ventilated, but the brilliant sunshine which is experienced for the greater part of the year must play a considerable part in killing the tubercle bacilli exposed to it. Tuberculosis is therefore largely spread among intimate house contacts.

Malaria was not found to influence the incidence of tuberculosis.

The report is well illustrated with photographs. An index would be a useful addition to facilitate reference to the points made.

[It is impossible in an abstract to do justice to this report. Dr. Bardswell wrote in a fascinating manner, and in the short time at his disposal collected a mass of information which is given in detail. The survey of primitive or semi-primitive people is not an easy matter and the arguments against using the Mantoux test are very strong, but it would be unwise to compare too closely the results of the Moro test, carried out with tuberculin not freshly prepared, with those obtained elsewhere by the use of freshly diluted tuberculin administered by the Mantoux technique. X-ray diagnosis was apparently not attempted to any extent in the investigation, and physical examination was the standard test, with or without sputum examination. An error is made (p. 75) in the reference to the work of the reviewer (*Bull. of Hygiene*, 1938, Vol. 13, p. 628), who found a morbidity rate (which he did not claim to be an exact picture of the actual position) of 11·55 per 1,000 in 9,866 Natives of Tanganyika Territory. This figure is wrongly given by Bardswell as the mortality rate.] *C. W.*

CUMMINS (S. L.); WILCOCKS (Charles); COCHRANE (E.); BRADFIELD (E. W. C.); BARDSWELL (N. D.); DAVIES (H. N.); COOPER (Mrs. Martin). **The Control of Tuberculosis in Tropical and Subtropical Regions.**—*Trans. 24th Ann. Conference Nat. Assoc. for Prevention of Tuberculosis.* 1938. pp. 129–166. With 2 maps (1 folding) & 3 figs. [Summary appears also in *Bulletin of Hygiene.*]

This volume gives the papers read by many speakers covering the subjects of the employment of ex-patients, the boarding-out of children from tuberculous households, anti-tuberculosis activities in rural areas, the family and tuberculosis and the mental aspects of tuberculosis. The section which will most interest readers of this *Bulletin*, however, is that devoted to the control of tuberculosis in tropical and subtropical regions.

In opening the session the Marquess of DUFFERIN and AVA remarked that an increase in tuberculosis has recently been reported in many British Colonies, and that in some it is already one of the chief causes of death. Professor S. Lyle Cummins gave an account of the early investigations into the tuberculosis of native races [of which he himself is one of the pioneers] and quoted the findings of BORREL in the Senegalese troops, and those made by the British in the South African Native Labour Corps in France during the war. In the circumstances, these Natives showed an enormous mortality, 221·9 per 10,000 in the case of the South African Native Corps. In Africa the Natives appear to show a resistance to the *onset* of tuberculosis far more effective than the immunity they develop to the disease when once started, which is of a low order. Under natural conditions of village life infection very often leads to no more than a positive tuberculin reaction.

Wilcocks outlined proposals similar to those detailed in this *Bulletin*, 1938, Vol. 35, p. 629. Cochrane gave an account of the work done in British Guiana [see also *Bull. of Hygiene*, 1937, Vol. 12, p. 739]. Important measures instituted were the examination of contacts and the introduction of collapse therapy, which has been applied to 42 patients with considerable success. Bradfield described the position in India where 2,000,000 persons are estimated to be suffering from tuberculosis. It is intended to allot 75 per cent. of available funds to organizations primarily of a preventive character, and the dispensary

is to be the pivot of the whole scheme which is now, thanks to the King-Emperor's Anti-Tuberculosis Fund, being actively inaugurated.

Bardswell described the conditions encountered during his investigations in Cyprus. A summary of his report on that country is given above.

Davies has been actively engaged in tuberculosis work in Tanganyika Territory for 11 years. Infection and disease spread primarily in the homes of sputum positive patients. He considers that natives showing a strongly positive tuberculin test have acute foci in a lymphatic node only waiting to spread after further stimulus. It has been found that contacts showing strong reactions have gradually lost the intensity of response to tuberculin and gained in health after the removal or death of the sputum positive persons responsible for their infections.

The capacity to resist infection—that is to prevent infection from progressing to disease—depends upon the dose received, the general immunity and the removal from further massive reinfection.

Patients with advanced disease rarely live more than two years after first being diagnosed. Since 1933, pneumothorax treatment with supplementary surgical measures has been applied to 261 patients under conditions of great difficulty, in hospital and dispensaries on the slopes of Kilimanjaro. A village settlement has been constructed and is now occupied. In general, Davies corroborates the findings of Wilcocks in the same Territory [*Bull. of Hygiene*, 1938, Vol. 13. p. 628].

[From his knowledge of Davies's work the reviewer can confirm the success of his methods and the arduous nature of the task. The importance of this demonstration of the success of modern methods in the treatment of native tuberculosis cannot be over-emphasized. It is the largest undertaking of its kind in East Africa. See also below.

Mrs. Martin Cooper described the anti-tuberculosis work being done in Jamaica. *C. W.*

DAVIES (H. N.). **The Work of a Tuberculosis Unit in East Africa.**—*Tubercle*. 1938. Nov. Vol. 20. No. 2. pp. 76–88. With 6 figs., 1 map & 1 graph. [Summary appears also in *Bulletin of Hygiene*.]

This is an account of the work done by the tuberculosis unit, which includes a hospital and 10 outlying dispensaries at Kibongoto on the slopes of Kilimanjaro, Tanganyika Territory, and a branch hospital in the Pare mountains, under the direction of the author, from 1927 onwards. Considerable numbers of patients suffering from tuberculosis had previously been reported from this part of Tanganyika Territory, and it was decided that the disease was prevalent enough to warrant special measures.

Investigation was conducted by means of the Mantoux test using a dilution of 1 in 10,000, and by the examination of natives presenting themselves at the dispensaries which were gradually instituted. Special attention was paid to those with chest complaints, and a feature of the work was the examination of the family contacts of cases of tuberculosis. Thus 1,108 contacts of 81 sputum positive persons were examined in one village, and 82 further cases of disease and 526 infected persons were found among them. In the same village among 680 positive tuberculin reactors 22 per cent. developed clinical disease within five years. A large percentage of bone and joint cases were found to be contacts of sputum-positive persons. Reports

from the Veterinary Department show that tuberculosis in cattle is negligible.

The author repeatedly emphasizes that marked infection and tuberculous disease were found in the members of families where sputum-positive cases existed. He found that persons showing strongly positive tuberculin reactions were comparatively easily precipitated into manifest disease, especially if contact was maintained, but records investigations which showed that the intensity of these reactions decreased if contact was broken, with a corresponding improvement in general health.

At the end of 1936 almost 3,000 cases of tuberculosis had been seen by the unit, and of these 2,122 were local natives [the population of the whole district was 164,119 according to the 1931 census]. Pulmonary tuberculosis was present in 1,441, of which 940 were known to be sputum-positive. Glandular disease, including bronchial adenitis, was present in 498. In the classification of 1,000 pulmonary cases (according to the method of Lyle CUMMINS) 51 per cent. were acute initial and 53 per cent. were in an advanced state [presumably on first diagnosis].

At first only simple sanatorium treatment was given, but from 1933 onwards, collapse therapy was used and was aided by X-ray facilities which became available then. The X-ray apparatus used was that introduced into Tanganyika by the reviewer.

Artificial pneumothorax with or without additional measures, was given to 219 patients, of whom 200 were followed up. Phrenicectomy alone was used in 31 cases and in a few others various operative measures were undertaken. In all, collapse treatment was given to 261 patients, of whom 238 were traced at the end of 1937. Of these 142 were alive and 96 were working, and of these 96 the periods since the commencement of treatment were as follows :—

Years	—1	1	2	3	4	Total
Numbers ...	9	27	12	24	24	96

Comparing advanced cases treated by collapse with similar cases treated by purely medical measures, the following table may be constructed of those dying within one year :—

Classification	Collapse treatment		Medical treatment	
	Number	Percentage dead	Number	Percentage dead
A.3	87	34	153	92
C.3	100	27	137	73

Recently a village settlement has been started near the hospital, and five or six families live on small farms, pursuing suitable handicrafts under close medical supervision. It is hoped to extend this after-care establishment.

[The reviewer has some first-hand knowledge of the work of Dr. Davies and the difficulties he has experienced and overcome. This work has demonstrated that collapse therapy can be used with success even in native peoples provided that those administering it are patient and enthusiastic. It should stimulate others throughout the tropics to take in hand the treatment of tuberculosis, which is too often regarded as impossible. See also COCHRANE, *Bull. of Hygiene*, Vol. 13, p. 874 and WILCOCKS, *Ibid*, p. 628.] *C. W.*

SMITH (W. Harden). **Pulmonary Tuberculosis in Africans.**—*East African Med. Jl.* 1939. Jan. Vol. 15. No. 10. pp. 318–328. [15 refs.] [Summary appears also in *Bulletin of Hygiene.*]

This paper is an adequate summary of the work published on tuberculosis in African natives and American Negroes in recent years, with the author's views on method of control. Only two factors are capable of control, namely the open case and the economic conditions. Of the latter, housing is the most important, and in rural communities much can be done if the intelligent co-operation of native chiefs is enlisted. In the control of sputum positive cases treatment and segregation are available and it is important that patients who develop the disease away from their own districts should be repatriated and that supervision should be attempted where they feel no sense of strangeness. The work of the tuberculosis hospital at Kibongoto, Tanganyika Territory, is quoted as an example of what can be done for patients near their homes.

Tuberculosis is a major problem in Africa and though no dramatic measures are possible, there are many indirect ways in which it may be reduced. *C. W.*

CARMICHAEL (J.). **Tuberculosis. Investigations in Uganda.**—*East African Med. Jl.* 1938. Oct. Vol. 15. No. 7. pp. 220–231. [15 refs.] [Summary appears also in *Bulletin of Hygiene.*]

This is a report of valuable work on the typing of strains of *Myco. tuberculosis* recovered from animals and man in Uganda. Tuberculosis is rare in the humped Zebu cattle so common in East Africa, and a post-mortem incidence of only 0·8 per cent. was found in 33,627 carcasses inspected. Double intradermal tests on 178 gave one positive result, or 0·6 per cent. On the other hand an incidence of 17 per cent. was found in the carcasses of 5,908 Ankole cattle inspected. Tuberculin tests on 360 in one district showed 56 per cent. positive. Half of the lesions found are confined to the thoracic cavity. Of 31 strains of tubercle bacilli isolated from cattle, all were of the typical dysgonic bovine type.

Three healthy Zebu calves were inoculated with 50 mgm. [? subcutaneously] of a standard British bovine strain which normally kills, in this dosage, in six weeks. The lesions found in these Zebu calves, however, were local and retrogressive, with only slight tendency to generalization. This finding supports other observations on the apparent resistance of the Zebu cattle to tuberculosis.

Tuberculosis was found in 12 sheep, in one of which, the first recorded instance, the human type was the cause of the lesions. Twelve tuberculous goats were seen, all infected by the bovine type. No signs of tuberculosis were seen in the human occupants of the huts

in which three tuberculous goats were found. [But it would have been interesting to have tested their reactions to tuberculin.]

In a community in which it is the custom for man and animals to inhabit the same houses it is obviously important to know to what extent disease is transmitted. The bovine type of tubercle bacillus is fully pathogenic for man.

The author has typed the organisms recovered from 247 cases of *pulmonary* tuberculosis in various tribes in Uganda. Four were of the bovine type and were found in tribes which live in close contact with cattle. This proportion corresponds roughly with European figures and the findings serve to demonstrate that the bovine organism plays a part in the epidemiology of tuberculosis in Uganda.

[It would be instructive to know if the high rate in the Ankole cattle were reflected in a higher tuberculin rate or morbidity rate from tuberculosis among the natives owning such cattle than is found in the tribes owning Zebu cattle.] *C. W.*

KETTELKAMP (G. D.), MURPHY (Paul) & TRUMPE (Darrell). **Results of Treatment of Tuberculosis in the Negro.**—*Amer. Rev. Tuberculosis.* 1938. Oct. Vol. 38. No. 4. pp. 458–465. [Summary appears also in *Bulletin of Hygiene.*]

In recent years more and more evidence is coming to light to show that tuberculosis in the Negro is not the hopeless condition it was formerly thought to be.

The authors have compared the whites and the negroes who constituted two groups of 1,000 consecutive discharges from the Robert Koch Hospital, St. Louis, in 1922–1926 and 1933–1937. No definite manifestations of tuberculosis peculiar to the negro were noticed, and the negroes are very amenable to sanatorium treatment. As a group the whites leave hospital in better condition than do the negroes, but the disparity is not so great in the later as in the earlier group. The results in the earlier group varied with race, in the later group with sex. Thus in the later 1,000 discharges the (descending) order of desirability of end results was: White female, negro female, white male, negro male. On the whole, the negroes had more severe symptoms on admission than the whites.

The negroes are now exhibiting a widespread appreciation of the modern methods of combating tuberculosis and a willingness to avail themselves of all the opportunities afforded them.

[These results are of particular interest and value to workers who are introducing the modern methods of treatment into Africa. See also DAVIES, above.] *C. W.*

GIOSEFFI (M.). Malaria e tubercolosi. [**Malaria and Tuberculosis.**]—*Riforma Med.* 1938. Oct. 8. Vol. 54. No. 40. pp. 1548–1550. [Summary appears also in *Bulletin of Hygiene.*]

Three views are held regarding the interaction of malaria and tuberculosis. The first is that there is an antagonism between the two and that malaria confers immunity and aids fibrosis. The second is that malaria predisposes to and aggravates tuberculosis. The third is that malaria has no influence on tuberculosis.

During an epidemic of malaria in Istria the author had the opportunity of studying the question. He examined 1,129 persons from 170 family groups and compared his findings with those made by

LOY in 1,898 autopsies. LOY holds that malaria has a deleterious influence on tuberculosis, and the author's findings, making allowance for the fact that they were in living people, while LOY's were in autopsies, were not unlike the latter's.

The author finds that well treated malaria has no injurious action on chronic fibrous lesions, but that in active pulmonary tuberculosis malaria exerts a harmful effect by reducing general and local resistance. Attempts to treat tuberculosis by inducing malaria are unjustified, and energetic treatment of malaria in tuberculous persons is essential. It should not be overlooked that loss of weight, oscillations of temperature, chills and sweats are symptoms of tuberculosis, and attention should be paid to the respiratory system in the examination of patients in malarious regions, especially if symptoms do not yield to antimalarial drugs. In such areas also the blood of tuberculous persons should be watched for parasites. *C. W.*

SEN (P. N.). The Problem of Tuberculosis in India.—*Jl. Indian Med. Assoc.* 1938. Dec. Vol. 8. No. 3. pp. 160–166.

FERRER (Isabel). **Treatment of Chronic Ulcers with Formalin.**—*Monthly Bull. Bureau of Health.* Manila. 1938. Apr. Vol. 18. No. 4. pp. 155–156.

Although many chronic ulcers respond to the classical and well tested local treatments commonly used, there are ulcers which resist. Fourteen children with chronic ulcers of one month to two years' duration were treated by washing the ulcer with 10 per cent. formalin solution and scraping the necrotic tissues with a cotton ball. Excess of formalin was washed out with sterile water, the wound was dried very well with plain cotton and was then liberally painted with saturated gentian violet solution. This was allowed to dry in the sun for 10 minutes and no dressing was applied but the children were prevented from playing in dusty places. In one case this treatment was repeated every other day [presumably, though it is not definitely stated, it is preferable to apply it daily].

Of the 14 children, four refused to continue the treatment on account of the (little) pain caused by the formalin. These were not yet cured after six months of the usual antiseptic dressings. The remaining 10 children were cured in two or three weeks under the formalin-gentian violet treatment. Cost is very small and no dressings are needed. *C. W.*

STROCCHI (Ottaviano). L'ulcera tropicale. Curata con applicazioni locali di Neojodo I.C.I. in soluzione. [**Tropical Ulcer—Local Treatment by Neojodo I.C.I.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1938. Aug. Vol. 19. No. 8. pp. 499–507.

The author treats tropical phagedaenic ulcer by first cleansing with hydrogen peroxide and then applying gauze saturated with a preparation of arsenobenzol and iodine, which he names "Neojodo I.C.I." This is applied in 3 per cent. solution on alternate days and skin growth is assisted by adhesive plaster [presumably covering the whole]. In the later stages, when healing is evident, the Neojodo I.C.I. may be used in 1 per cent. solution.

Three cases are described and healing took place in from three to four weeks, the ulcers having been extensive and foul at the beginning of treatment. *C. W.*

GOODMAN (M. H.). **Chronic Streptococcic Ulcer of the Skin: Unresponsive to Local Therapy but cured by Sulfanilamide: Report of Two Cases.**—*Jl. Amer. Med. Assoc.* 1938. Oct. 15. Vol. 111. No. 16. pp. 1427–1431. With 7 figs.

Though the case here described did not occur in the tropics, the condition of chronic ulcer is so common there that any treatment found successful is worth noting in order that it may be given a more extensive trial.

The patient gave a history of having been bitten by insects six to seven weeks before being seen by the author; all the spots had healed and had caused no trouble, except two, one on the arm and one on the leg. These became swollen, red and tender and were incised; in spite of the local application of antiseptics the sores did not heal but became progressively larger. Among the various preparations locally applied without benefit were, 3 per cent. aqueous-alcoholic gentian violet, 10 per cent. ammoniated mercury ointment, boric ointment, compresses of 1 : 1,000 bichloride of mercury, solutions of potassium permanganate, chloramine-T and others. A β-haemolytic streptococcus was isolated. By this time the ulcer had a markedly inflamed, necrosing, undermined, serpiginous border, with an uneven, glazed, granular base discharging a thin yellowish serous fluid. Within 48 hours of treatment by sulphanilamide being started healing set in and was uneventful. The initial doses were 60 grains daily (in three doses), reduced gradually to 15 as the healing progressed. A second case in which the chronicity and appearance led to the suspicion of the ulcers being tuberculous, but from which streptococci were again isolated, yielded similarly to sulphanilamide. In a footnote mention is made of a third patient with five large ulcers on one leg and three on the other which had failed to respond, even after several months, to local treatment, but cleared readily with sulphanilamide. *H. H. S.*

MONTEL (L. R.). Traitement de la dishydrose et de l'eczéma dishydrosique de Brocq (Hong Kong Foot, Athletic Foot) par les dérivés sulfamidés intus et extra. [**Treatment of "Hongkong Foot" by Sulphamide Derivatives.**]—*Rev. Méd. Française d'Extrême-Orient.* 1938. Apr. Vol. 17. No. 4. p. 443.

Brocq's eczema, known locally in South China as Hongkong foot, has been ascribed to, at least found associated with, Penicillium, Aspergillus and *Trichophyton pedis* α and β [see this *Bulletin*, 1931, Vol. 28, p. 396] and with *Epidermophyton interdigitale* [*idem* 1932, Vol. 29, p. 272]; others maintain that it is streptococcal. The author supports this last view. Lesions may extend beyond the toes and even become a generalized eczema. Preparations containing ichthyol, or iodine, or salicyclic acid have all been reported as beneficial, but their action is far from constantly so. The author has found sulphamide derivatives most successful in his cases, given internally, or in the form of Rubiazol injected intramuscularly or Septazine intravenously. Benefit accrues also when 1 per cent. rubiazol is applied locally. Apparently these are not alone sufficient for a permanent cure, since the use of alcohol iodine salicylic acid is recommended to be used for a "long time after cure to prevent relapse caused by the fungal or microbial parasites which infest the skin of parts previously affected." *H. H. S.*

REVIEWS AND NOTICES.

FINDLAY (G. M.) [C.B.E., M.D., D.Sc., Wellcome Bureau of Scientific Research, London]. **Recent Advances in Chemotherapy.** With a Foreword by C. M. WENYON, C.M.G., C.B.E., M.B., B.S., F.R.S. Second Edition.—pp. x+523. With 1 chart. 1939. London: J. & A. Churchill Ltd., 104, Gloucester Place, Portman Square. [21*s.*]

The eight years which have elapsed since the appearance of the first edition of this book [this *Bulletin*, 1930, Vol. 27, p. 1029] have produced such a mass of experimental work on the mode of action of drugs, and have witnessed discoveries of such practical significance that it is not surprising that the author, in order to find space for these advances in knowledge, without increasing the size of the volume, has found it necessary to re-write the second edition almost entirely, omitting much of interest which was contained in the first edition.

The discovery that in the sulphonamide drugs we have chemotherapeutic agents of great value in the treatment of acute bacterial infections—a discovery equal to, if not more important than, the original introduction of arsphenamine by Ehrlich—has proved a great stimulus to chemotherapeutic investigations throughout the world.

The volume covers an enormous field dealing with the chemotherapy of helminthic infections, of amoebiasis, leishmaniasis, trypanosomiasis and malaria, of syphilis, and of tuberculosis and leprosy, of the acute bacterial infections and of the virus infections. Curiously enough the spirochaetal infections other than syphilis, and the important infections due to the piroplasma group, are ignored in the present edition, although an important addition to the therapy of the latter group has been made by the discovery of acapron.

The chapter relating to the chemotherapy of malaria has been extensively revised, and naturally much space is devoted to a discussion of the new synthetic compounds plasmoquine and atebrin. The great amount of experimental work which has been done during the last 10 years on the mechanism of the action of drugs and on the significance of drug-resistance has necessitated the complete re-casting of the chapter on the chemotherapy of trypanosomiasis.

As, however, might be anticipated, the main change in the book is found in the chapter dealing with the chemotherapy of acute bacterial infections. How intense has been research on this subject since the discovery of the anti-streptococcal activity of prontosil by Mietzsch and Klarer in 1932 can be judged from the fact that the space devoted to the treatment of acute bacterial infections has been increased from 34 pages in the first edition to 164 pages in the present edition.

Valuable lists of references are given at the end of each section, making it easy for the reader to pursue more fully any point dealt with in the book. An important innovation in the present edition is that an author's index has been added to the subject index at the end of the book.

In the reviewer's opinion it would be difficult to write too highly of this most excellent work. Not only will it prove most useful to the laboratory investigator as a book of reference, but it will also be of the greatest practical value to the physician in the tropics, and to others who may have little access to current literature. *W. Yorke.*

INTERNATIONAL LABOUR OFFICE. Studies and Reports Ser. B. (Economic Conditions) No. 26. **Labour Conditions in Indo-China.** 1938. Geneva. pp. 85–92. **Medical Protection.** [Review appears also in *Bulletin of Hygiene.*]

Indo-China is a French colony with some 23,000,000 native population. Economic and social development is rapidly and completely transforming the country; the old-time family system still dominates home industries, but is being replaced by the industrial system for new mining and industrial undertakings. For this latter purpose, contract labour has to be moved to the undertakings. The well-being of such labour requires supervision. The workers have to be medically inspected and vaccinated when recruited and repatriated, and are under medical supervision during their stay on the plantations. Returns of sickness and death must be made. Medical attention is given during sickness, in hospital if serious. If there are 6,000 workers, a whole-time doctor must be engaged. Otherwise, one doctor may serve several neighbouring plantations. On "red lands" where malaria is rife, 1·75 grammes of quinine must be taken every week, mosquito nets are required, and other anti-malarial measures, such as drainage, must be adopted. Clearing ground on "red lands" is particularly unhealthy work; but anti-malaria precautions under the auspices of the Pasteur Institute have done good work. In one instance, a percentage of deaths of 26·3 in 1927 fell by 1931 to 0. In another, the percentage of cases of unfitness for work fell from 20 or 25 to 3. These measures mean an increase of 40 per cent. in the value of labour employed. But they have to be constantly maintained. Control of drinking water has caused the almost entire disappearance of diseases due to bad water. Boots and leggings with antiseptic washes are abolishing troublesome ulcers. Fresh vegetables increase resistance to disease; and Java rice is banishing beriberi. The employer is responsible for burial and for finding heirs to any property and deferred pay. The mortality of plantation workers was 5·4 per cent. in 1927, 4·5 per cent. in 1928, 2·83 per cent. in 1929, and 2·32 per cent. in 1930; all high rates, since they apply to persons in the prime of life who were medically examined on recruitment. The whole of this report which deals with the introduction of "civilized" industry among native races is of great interest. *E. L. Collis.*

JORGE (Ricardo). **Fièvre jaune.** [Yellow Fever.]—*Arquivos do Instituto de Higiene.* Lisbon. 1938. Vol. 4. No. 1. pp. xv+134. With 10 figs. (1 coloured).

The present interest in yellow fever, one of the three great traditional pestilences—plague, cholera and yellow fever—depends not so much on its ravages in the past as on the succession of recent discoveries concerning its epidemiology and control.

During the past twelve years, the distinguished author, as the delegate for Portugal on the Committee of the International Public Health Office, has taken an active part in the study of the problem of yellow fever, and in the present publication has given a graphic description of some of the more important stages in the growth of our present-day knowledge. Very appropriately, in view of his official position, the author reproduces certain communications and suggestions made by him at meetings of the International Committee, illustrating the various points dealt with in this book.

These are considered as three acts of a dramatic film. Africa is the scene of the first act where early this century the existence of yellow fever could no longer be concealed. Then various erroneous theories as to its nature were followed by the foundation of the laboratory at Lagos and the discovery of the susceptibility of *Macacus rhesus*. The second act comprises both Africa and America. In his historical introduction to this section the author states that it is generally admitted that Columbus found yellow fever already present in the Antilles when he discovered America, a view which is opposed to recent studies by Carter and others [see this *Bulletin*, 1932, Vol. 29, p. 245] supporting the African origin of the disease. The epidemic at Rio de Janeiro and also those at Dakar and Matadi again called attention to the potentialities of this disease, and each was suppressed by intense anti-mosquito campaigns. The Institute at Manguinhos became an active centre of yellow fever investigation.

In addition the long duration of yellow fever immunity (usually for life) was established by serological tests first in monkeys and then in mice, and these discoveries were applied, mainly through the help of the Rockefeller Foundation, to a delimitation of the endemic areas of the disease by means of protection tests in mice. The surprising results of these investigations, discussions on the diagnostic value of these tests, and the introduction of the use of the viscerotome in Brazil complete this section.

The third act opens in Brazil with the occurrence of outbreaks of yellow fever, in the absence of *Aëdes aegypti*, and in forest regions where any human origin of infection can be excluded. As a result, the existence of a jungle variety of the disease has been established, occurring in wild monkeys and possibly other mammals, and transmitted by species of mosquitoes other than *Aëdes*.

The various stages in these discoveries are presented with admirable fairness and impartiality, and Dr. Jorge's book constitutes a valuable addition to the literature on the subject which should be read by all those interested in recent developments in our knowledge of yellow fever. *E. Hindle.*

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